BOARD OF EDUCATION OF THE TOWNSHIP OF MONTVILLE, NJ

District-Wide Energy Savings Plan

REVISED – February 8, 2019

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BOARD OF EDUCATION OF THE TOWNSHIP OF MONTVILLE, NJ

District-Wide Energy Savings Plan

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SECTION A EXECUTIVE SUMMARY

Honeywell is pleased to submit this Energy Savings Plan for the Board of Education of the Township of Montville (Montville BOE). During the development of the Energy Savings Plan, Honeywell has completed a thorough investment grade energy audit of the Montville BOE's buildings and grounds. Based on the audit findings and Honeywell's extensive experience in working with school districts, we can confidently state that we can deliver a financially viable, comprehensive solution to address Montville BOE's facility concerns and goals. Our Energy Savings Plan includes projects that achieve energy and operational efficiencies, create a more comfortable and productive environment and are actionable via the New Jersey Energy Savings Improvement Program (NJ ESIP) in accordance with NJ PL2012, c.55.

The Energy Savings Plan is the core of the NJ ESIP process. It describes the energy conservation measures that are planned and the cost calculations that support how the plan will pay for itself through the resulting energy savings. Under the law, the Energy Savings Plan must address the following elements:

- The results of the energy audit;
- A description of the energy conservation measures (ECMs) that will comprise the program;
- An estimate of greenhouse gas reductions resulting from those energy savings;
- Identification of all design and compliance issues and identification of who will provide these services;
- An assessment of risks involved in the successful implementation of the plan;
- Identify the eligibility for, and costs and revenues associated with, the PJM Independent System Operator for demand response and curtail-able service activities;
- Schedules showing calculations of all costs of implementing the proposed energy conservation measures and the projected energy savings;
- Maintenance requirements necessary to ensure continued energy savings, and describe how they will be provided; and
- If developed by an ESCO, a description of, and cost estimates of a proposed energy savings guarantee.

The purpose of this document is to provide all the information required for the Montville BOE to determine the best path forward in the implementation of a District-Wide NJ ESIP Project. It is important to note that the Energy Savings Plan provides a comprehensive evaluation of ALL potential ECMs within the Montville BOE. This is not meant to infer that all the ECMs identified can be implemented. However, if the ECM is part of this plan, it may be implemented later as additional funding becomes available or technology changes to provide for an improved financial return.

Our Energy Savings Plan is structured to clearly demonstrate compliance with the NJ ESIP law, while also presenting the information in an organized manner which allows for informed decisions to be made. The information is divided into the following sections:

A. Executive Summary (This Section)

B. Preliminary Utility Analysis – The Preliminary Utility Analysis (PUA) defines the utility baseline for the Montville BOE buildings included in the Energy Savings Plan. It provides an overview of the current usage and a cost per square foot by building of utility expenses. The report also compares the Montville BOE's utility consumption to that of other districts in the same region on a per square foot basis.

C. Energy Conservation Measures – This section includes a detailed description of the ECMs we have selected and identified for your School District. It is specific to your facilities in scope, savings methodology and environmental impact. It is intended to provide a basis of design for each measure in narrative form. It is not intended to be a detailed specification for construction. ALL potential ECMs for the Montville BOE are identified for the purposes of potential inclusion in the program. Final selected ECMs are to be determined by the Montville BOE in conjunction with Honeywell during the project development phase of the NJ ESIP process.

D. Technical and Financial Summary – This section includes an accounting of all technical and financial outcomes associated with the ECMs as presented on the New Jersey Board of Public Utilities Forms II through IV. Information detailed on the forms includes projected implementation hard costs, projected energy savings, projected operational savings and projected

environmental impact. Form VI: Annual Cash Flow Analysis provides a "rolled-up" view of the overall project financials, inclusive of financing costs, on an annual basis as well as over the entire 15 or 20-year term of the agreement.

E. Measurement & Verification and Maintenance Plan – This section identifies the intended methods of verification and measurement for calculating energy savings. These methods are compliant with the International Measurement and Verification Protocols (IMVP), as well as other protocols previously approved by the Board of Public Utilities (BPU) in New Jersey. This section also includes the recommended maintenance requirements for each type of equipment. Consistent maintenance is essential to achieving the energy savings projected in this plan.

F. Design Approach – This section includes a summary of Honeywell's best practices for the successful implementation of a NJ ESIP project. It includes a project specific Safety Management Plan and provides an overview of our project management procedure, construction management and a sample schedule for the overall completion of the project. Within the schedule, we clearly define the tasks directed towards compliance with architectural, engineering and bidding procedures in accordance with New Jersey Public Contracts Law.

G. Independent Energy Audit – This section includes, for reference, the independent energy audits as previously received by the Montville BOE through the Local Government Energy Audit (LGEA) program. The audits, provided by TRC have been included on a USB drive as Appendix 1. A comparison can be made between the ECMs outlined in this Independent Energy Audit and the additional ECMs described in the overall Energy Savings Plan.

H. Energy Calculations and Greenhouse Gas Reduction Summary – This section titled Appendix 2: ECM Calculations includes all the energy calculations required to ensure compliance with the law and to confirm the energy savings can, and will, be achieved. These calculations are subject to an independent 3rd party engineering firm review for verification.

I. Equipment Cut-sheets – This section titled Appendix 3: Equipment Cut-sheets includes specification data for the equipment which shall be utilized as the basis of design for plans and specifications during the subsequent project development and NJ public bid phase.

J. Safety Management Plan – This section titled Appendix 4: Safety Management Plan establishes a plan for the implementation of Honeywell's Safe Operations Management (SOM) program. The document includes procedures and requirements specific to the Montville BOE necessary to support a safe workplace for all stake holders. The Safety Management Plan is a living document, which will be updated and modified to maintain its relevance throughout the project as site conditions and circumstances change.

Benefits

The measures investigated in this Energy Savings Plan could result in an annual utility savings of 776,946 kWh of electricity and save 10,945 therms of natural gas. The total utility cost savings is $3,871,208 over the life of the project. Additionally, these energy savings will result in a net reduction of greenhouse gases and will reduce the school district's carbon footprint by 753 Metric Tons of CO_2 annually. All these savings are achieved while improving the classroom environment and renewing many items that have been in service beyond useful life expectancy.

In accordance with the NJ ESIP process, the next step in the project development phase is for Honeywell to provide our recommendations and for the Montville BOE to select the desired content of the project based upon the Montville BOE's unique goals and objectives. The selections will consider the projected costs, projected energy and operational savings, available financing options at the time of the agreement, interest rates, length of term and Montville BOE priorities, which will all play a part in the final selection and cash flow of ECMs. The definitive requirement under NJ PL2012, c.55 is that the project is self-funding within the 15 or 20-year term as outlined in the legislation.

Overall, it is evident that the Montville BOE is well positioned to implement a program that will upgrade your facilities, while funding itself within the requirements of the law and with zero impact on your taxpayer base. We welcome this opportunity to partner with the Montville BOE to improve the comfort and efficiency of your facilities through the successful implementation of this Energy Savings Plan.

Sincerely,

Joseph J. Coscia
Energy Account Executive

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SECTION B PRELIMINARY UTILITY ANALYSIS

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Honeywell

Preliminary Utility Analysis

Montville Township Public Schools
Montville, NJ

Helping customers manage energy resources to improve financial performance

Executive Summary

Honeywell would like to thank you for the opportunity of providing you with this Preliminary Utility Analysis. A one year detailed billing analysis was completed for all utility data provided by your staff. The facility's electric and gas consumption were compared to a benchmark of typical facilities of similar use and location. It should be noted however, that some of Buildings which make up the benchmarking standards are not equipped with mechanical cooling (air conditioning). Therefore, these buildings may unjustly appear to be less efficient in comparison.

Through our Energy Services offerings, Honeywell's goal is to form a long term partnership for the purpose of meeting your current infrastructure needs by focusing to:

- Improve Operational Cost Structures
- Ensure Satisfaction
- Upgrade Infrastructure While Reducing Costs
- Meet Strategic Initiatives
- Leverage Teamwork
- Pursue Mutual Interests
- Provide Financing Options

How does it work?

Under an energy retrofit solution, Honeywell installs new, energy efficient equipment and optimizes your facility, as part of a multi-year service contract. Most of these improvements are cost-justified by energy and operational savings. Some of the energy conservation measures provide for a quick payback, and as such, would help offset other capital intensive energy conservation measures such as, boilers, package rooftop units, domestic hot water heaters, etc. The objective is to provide you with reduced operating costs, increased equipment reliability, optimized equipment use, and improved occupant comfort.

After review of the utility analysis, you can authorize Honeywell to proceed with the development of a detailed engineering report. The report development phase allows Honeywell to prepare an acceptable list of proposed energy conservation measures, which are specific to the selected facility. Some examples of typical Energy Conservation Measures include:

- Lighting
- Control Systems
- Boilers
- AC Units/Condensers
- Building Enevelope
- Package Rooftop Units
- Domestic Hot Water Heaters
- Plug Load Management

Why Honeywell?

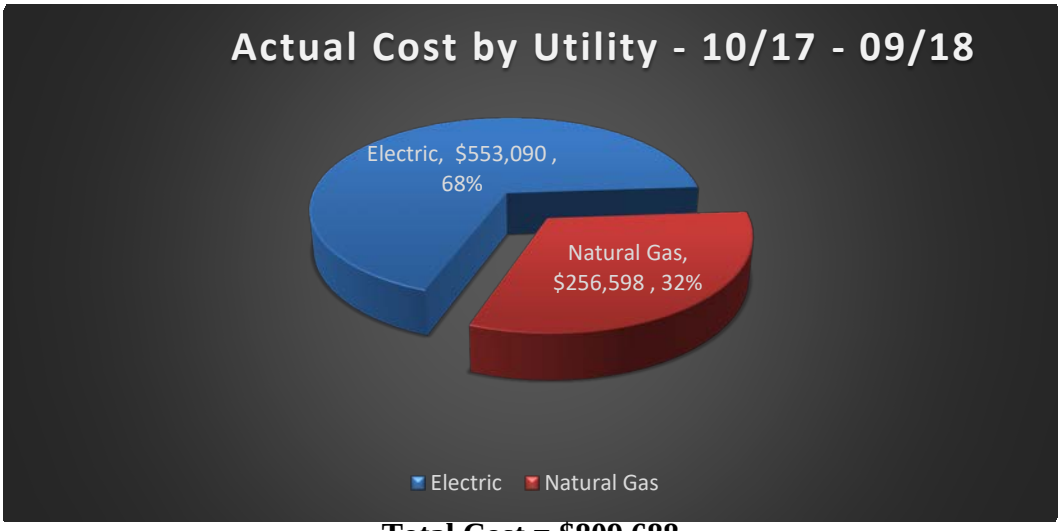
- Honeywell is one of the world leaders in providing infrastructure improvements
- With Honeywell as your building partner, you gain the advantage of more than 115 years of leadership in building services
- Honeywell has the infrastructure and manpower in place to manage and successfully implement your project
- Honeywell has over 30 years experience in the energy retrofit marketplace with over $5 Billion in customer energy savings
- Honeywell provides you with "Single Source Responsibility" - from Engineering to Implementation, Servicing and Financing (if desired)

Historical Summary

Utility Analysis Period:
October 2017 - September 2018

	Current Year (10/17-09/18)	
	Electric	**Therms (Gas)**
Utility Costs*	$553,090	$256,598
Utility Usage (kWh, Therms)	4,798,833	254,832
$ Cost/Unit (kWh, Therms)	$0.11526	$1.007
Electric Demand (kW)	16,176	

* Costs include energy and demand components, as well as taxes, surcharges, etc.



Total Cost = $809,688

Energy Benchmarking

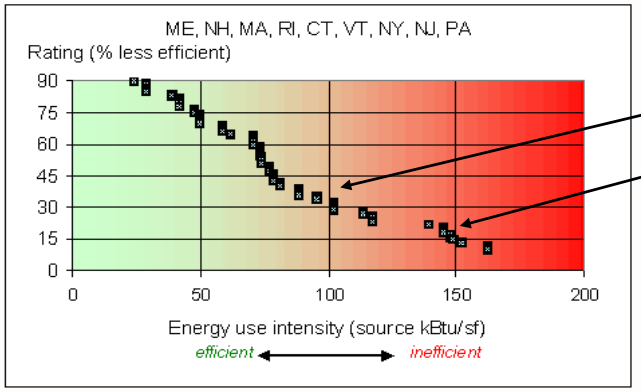
The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

The Source EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gases, and is thus an indicator of societal benefit.)

Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	below 25%	No
40 to 60%	20 to 35%	Maybe
20 to 40%	35 to 50%	Yes
Below 20%	above 50%	Definitely

Site EUI Rank		Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Therms)	Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	Cedar Hill Elementary School	263,784	22,040	46,262	67	107	30%
2	Hilldale Elementary School	339,280	9,537	37,055	57	120	32%
3	Lazar Middle School	889,371	59,875	113,900	79	133	30%
4	Montville High School	2,194,674	103,918	212,613	84	156	15%
5	Valley View Elementary School	456,480	19,770	54,725	65	122	28%
6	William Mason Elementary School	226,008	19,818	37,031	74	117	28%
7	Woodmont Elementary School	269,276	19,561	43,062	67	110	28%
8	Administration Building	159,960	313	7,000	82	241	0%

School Facilities

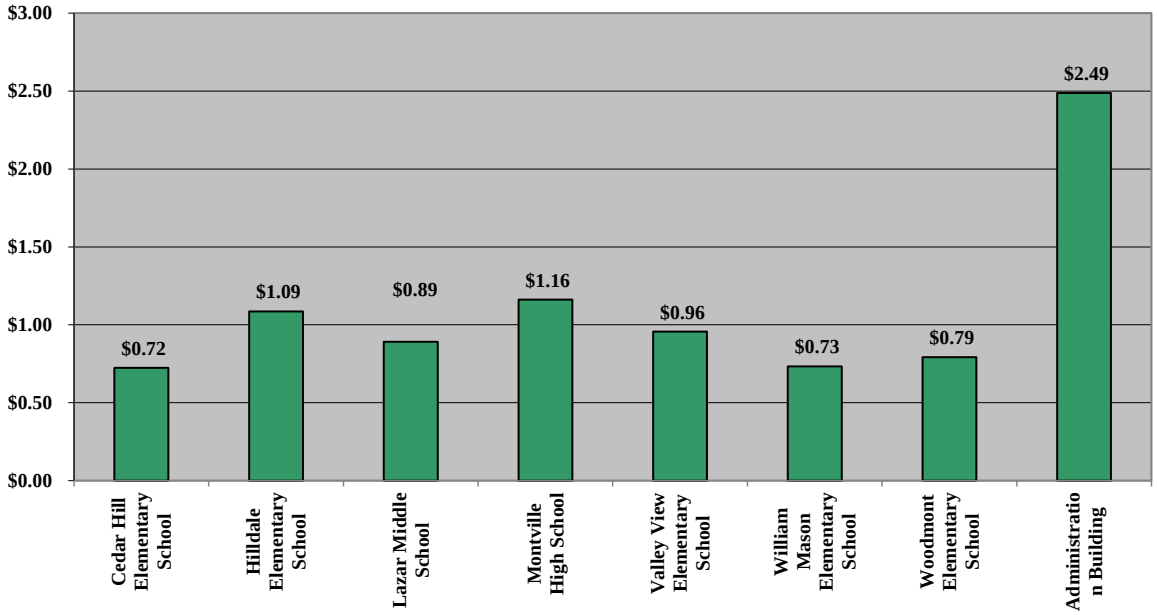


Source EUI	Est Regional Rating	Building
107	30%	Cedar Hill Elementary School
120	32%	Hilldale Elementary School
133	30%	Lazar Middle School
156	15%	Montville High School
122	28%	Valley View Elementary School
117	28%	William Mason Elementary School
110	28%	Woodmont Elementary School
241	0%	Administration Building

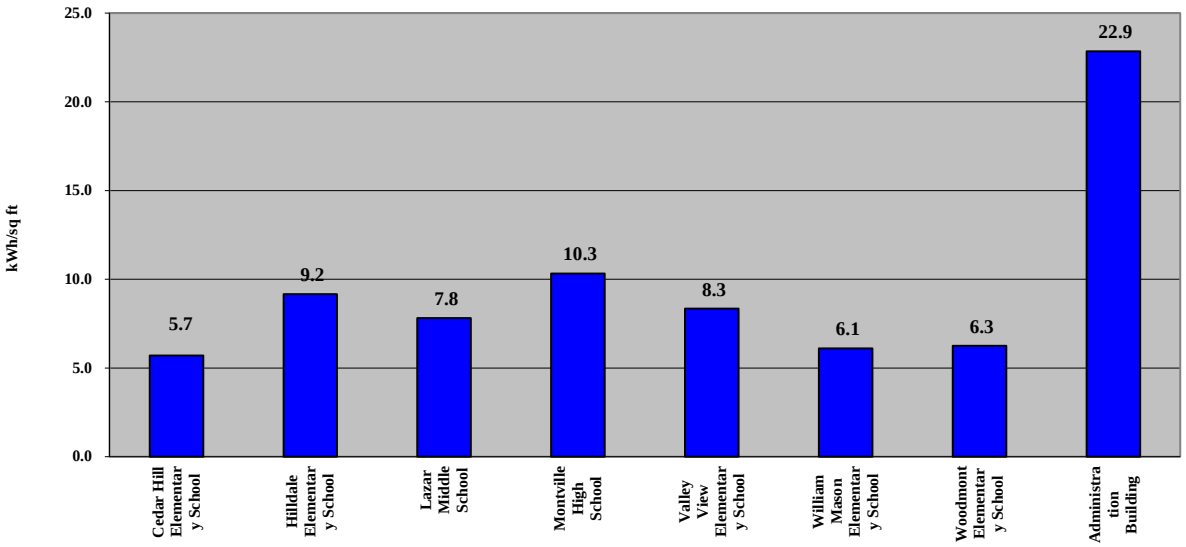
Utility Analysis - Electric

Square Footage Analysis

Cost per Sq. Ft.

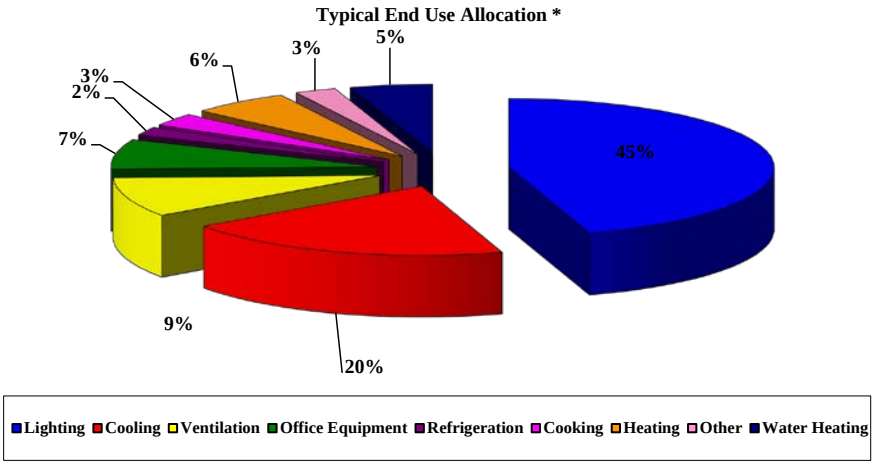


Usage (kWh) per Sq. Ft.



Utility Analysis - Electric

Sources of Electric Consumption

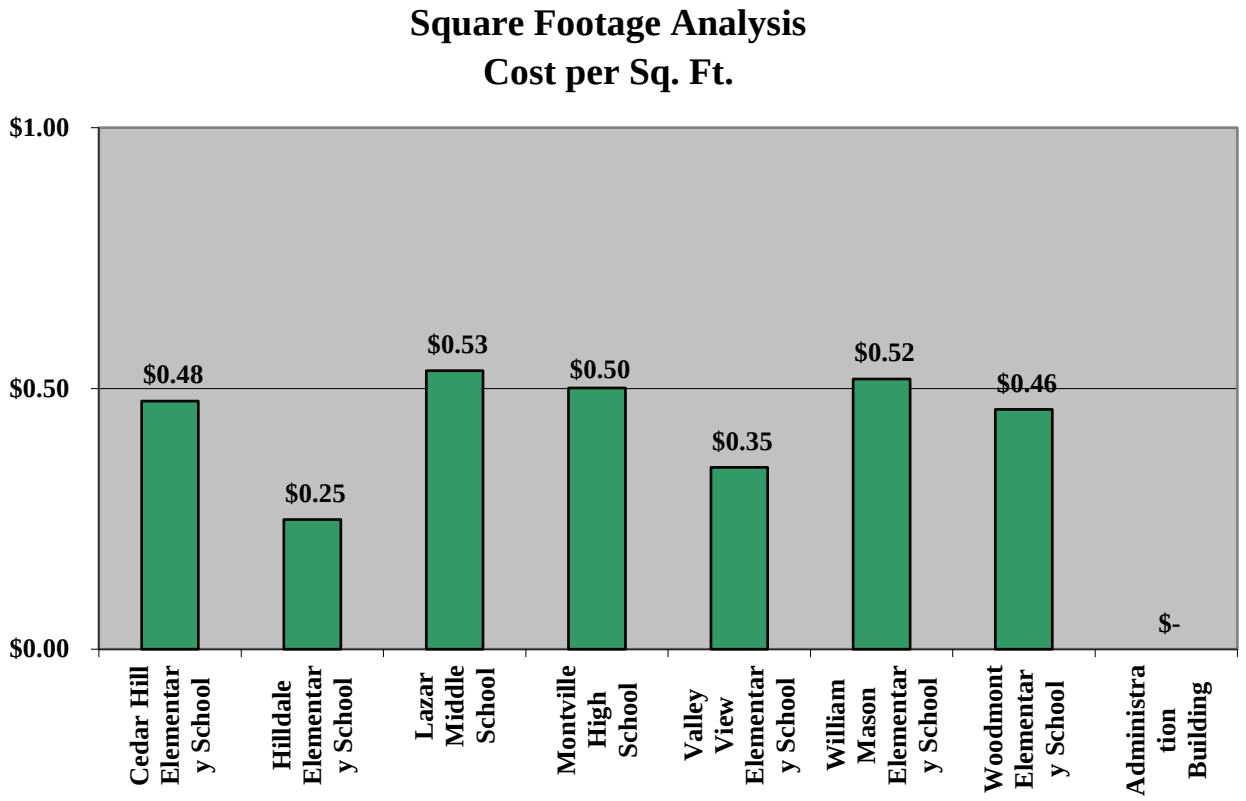


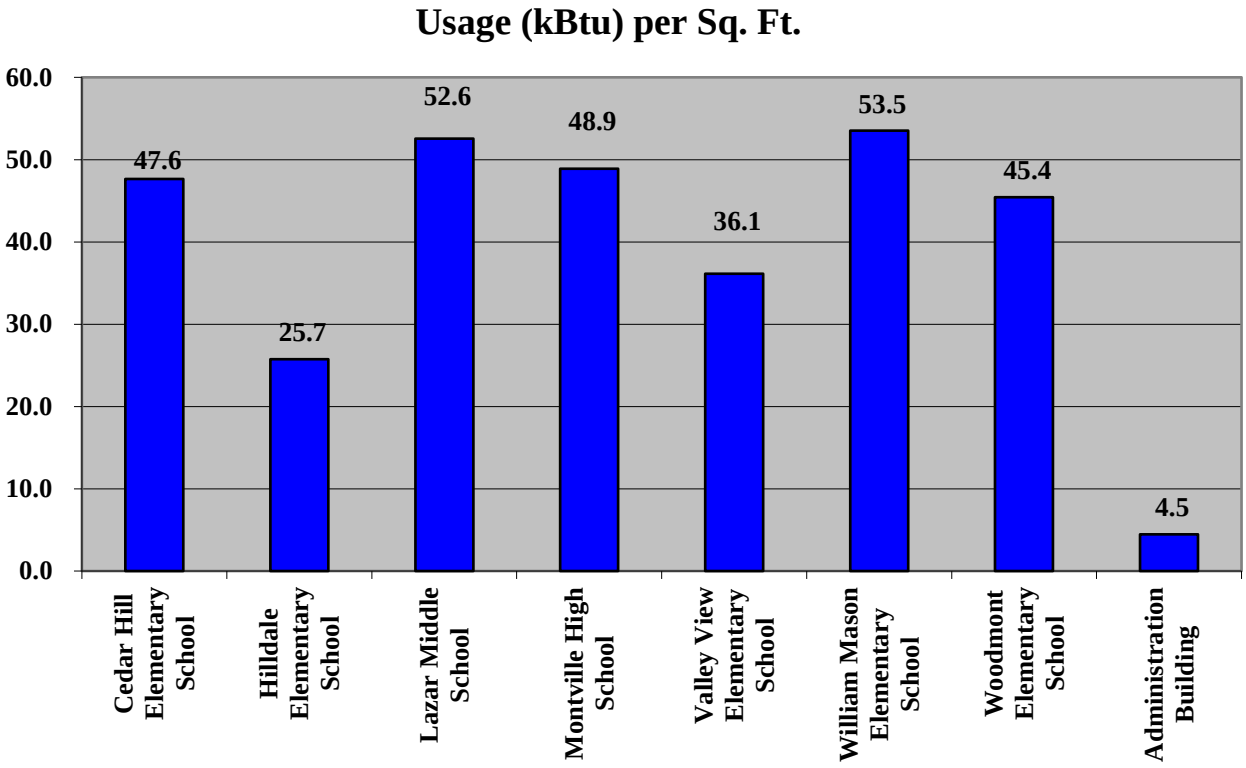
**This allocation is generic and is not a representation of the actual end use in your buildings included in this report.

Typical Allocation Applied to Your Electric Cost**

Lighting	$248,890
Cooling	$110,618
Ventilation	$50,884
Office Equipment	$38,716
Refrigeration	$11,062
Cooking	$16,593
Heating	$33,185
Other	$13,827
Water Heating	$27,654
Your 10/15-9/16 Total Cost	**$553,090**

Utility Analysis - Natural Gas

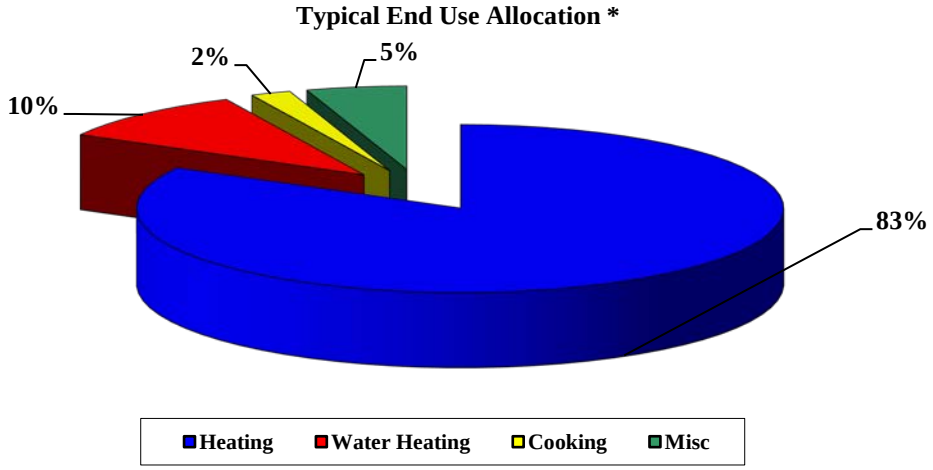




Utility Analysis - Natural Gas

There is a fairly direct correlation between your gas usage and heating degree days, indicating that the vast majority of your natural gas usage is for space heating.

Sources of Natural Gas Usage



**This allocation is generic and is not a representation of the actual end use in your buildings included in this report.

Typical Allocation Applied to Your Gas Cost**

Heating	$212,976
Water Heating	$25,660
Cooking	$5,132
Misc	$12,830
Your 10/15-9/16 Total Cost	**$256,598**

Annual Emissions & Environmental Impact

Montville Township Public Schools

Calendar Year 10/2015 - 09/2016

The following energy usage, cost and pollution have been quantified:

Total Annual Electric usage	4,798,833	kWh
Annual Natural Gas usage	254,832	Therms

Annual Greenhouse Gas Emissions

CO2	9,548,552	pounds
SO2	22,123	pounds
NOx	15,116	pounds

This is equivalent to one of the following:

300	No. of passenger vehicles - annual greenhouse gas emissions
176,715	Gallons of gasoline consumed - CO_2 emissions
3,653	Barrels of oil consumed - CO_2 emissions
134	No. of homes energy use for one year - CO_2 emissions
40,282	No. of tree seedlings grown for 10 years - carbon sequestered
335	No. of acres of pine or fir forests - carbon sequestered annually
65,458	No. of propane cylinders used for home barbeques - CO_2 emissions
8	No. of railcars' worth of coal burned - CO_2 emissions

Based on the US Environmental Protection Agency -
Clean Energy Power Profiler

Potential Retrofits

Retrofit Description	Utility/Fuel Type	Symptomatic Issues	Common Recommendations for Action
Lighting Retrofit and Motion Sensors	Electric/Natural Gas	Elevated EUI	Lighting and Controls UpGrade
De-Stratification Fans	Electric/Natural Gas	Elevated EUI	Redistribution of Conditioned Air
DHW Boiler Replacements	Electric/Natural Gas	Elevated EUI	Higher Efficiency Units
Classroom Unit Replacments	Electric	Elevated EUI	Higher Efficiency Units
RTU Replacements	Electric/Natural Gas	Elevated EUI	Higher Efficiency Units
Building Envelope Improvements	Electric/Natural Gas	Elevated EUI	Reduce Building In leakage
Roof Top Unit Replacements	Electric	Elevated EUI	Lower Energy Consumption
Computer Controllers	Electric	Elevated EUI	Lower Energy Consumption
Install Premium Efficient Motors	Electric	Elevated EUI	Lower Energy Consumption
CHP	Electric/Natural Gas	Elevated EUI	Lower Energy Consumption
Load Reduction	Electric	Elevated EUI	Lower Energy Supply Side Consumption

SECTION C ENERGY CONSERVATION MEASURES (EMCS)

INTRODUCTION

The information used to develop this Section was obtained through the independent energy audit building surveys to collect equipment information, interviews with operators and end users, and an understanding of the components to the systems at the sites. The information obtained includes nameplate data, equipment age, condition, the system's design and actual load, operational practices and schedules, and operations and maintenance history.

Honeywell has done a review of the Energy Conservation Measures (ECMs) which would provide energy and cost savings to the Montville BOE. This report aims to be an assessment of the feasibility and cost effectiveness of such measures, and an indication of the potential for their implementation. The ECMs listed below have been reviewed throughout your facilities for consideration within a complete Energy Savings Plan. What follows is a general description of the energy auditing process and the detailed descriptions of the Energy Conservation Measures for your facilities.

ENERGY CONSERVATION MEASURES

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
1A LED Lighting	✓	✓	✓	✓	✓	✓	✓	✓
1B Lighting Controls / BMS Integration	✓	✓	✓	✓	✓	✓	✓	✓
1C Destratification Fans	✓	✓	✓	✓	✓	✓	✓	
1D Vending Misers	✓	✓	✓	✓	✓	✓	✓	✓
1E Plug Load Management	✓	✓	✓	✓	✓	✓	✓	✓
2A 500/600 Wing Airedale Replacements				✓				
2B 500/600 Wing VRV Replace / Refurb.				✓				
2C RTU Replacements			✓	✓	✓		✓	
2D Motor and VFD Replacements	✓	✓	✓	✓	✓		✓	
2E Split System Replacements				✓	✓			
2F DHW Replacement			✓	✓				
2G Pipe Insulation					✓			
2H Kitchen Hood Controls			✓	✓				
2I Walk-In Compressor Controls			✓	✓				
3A Transformers	✓	✓	✓	✓	✓	✓	✓	
4A Building Envelope Improvements	✓	✓	✓	✓	✓	✓	✓	✓
5A Solar PPA	✓	✓	✓	✓	✓	✓	✓	
6A Cogeneration CHP				✓				
7A Permanent Load Reduction	✓	✓	✓	✓	✓	✓	✓	✓
8A Computer Power Management	✓	✓	✓	✓	✓	✓	✓	✓

OVERVIEW

Honeywell has closely evaluated and audited the District to develop the optimum mix of energy saving measures. These selected site-specific measures have been developed using the following process:

- Review Site Audits
- Engineering Team Site Visits
- Develop Measures
- Review Measures with Team

Reject and Accept Measures Based On

- Alignment with Critical Success Factors (CSF)
- Value to the School
- Economic Financial Payback

- Equipment Service Life
- Effect on Current Space Conditions

In developing the proposed measures, the following considerations were critical:

- Reduction of space heating and cooling loads by performing a systems review, with complete consideration of current indoor environmental quality standards.
- Review and redesign lighting systems noting reductions in the internal heat gain in the affected spaces.
- Load reduction measures always precede optimization measures.

Bin weather data was used from a 15-year average reported from Newark, NJ. Ventilation rates, taken from ASHRAE published standard, were predicted by using the building's population multiplied by cfm/person during occupied hours.

Reasonable infiltration rates were assumed based on the building's fenestration conditions and expected values for typical school buildings. A reduced infiltration rate was assumed for the unoccupied hours. Envelope heat loss calculations assumed a reasonable heat transmission rate (U value) based on the construction of the buildings. Wall area and glass area were estimated by supplied drawings and field photographs.

Current efficiencies were derived from assumed and later to be measured boiler efficiencies, and assumed system losses due to thermal losses, distribution losses and loose operational control. The current assumed boiler system efficiencies were then applied to the calculated load and calibrated to last year's actual fuel consumption.

Demand Sensitive Operation

Review existing and proposed thermal loads. For example, the review process will facilitate the application of:

1. Optimized flow rates (steam, water, and air).
2. Optimized operation of equipment, matching current occupancy use profiles and considering both outside and indoor space temperatures.

Benefits of Mechanical Improvements

Listed below are some of the benefits that the School would reap from the mechanical portion of the measures:

1. Avoid costly repairs and replace equipment that would have to be replaced in the next five years.
2. Improved compliance with ASHRAE Ventilation Standards.
3. Ability to trend ventilation rates; thus, insuring compliance through documentation.
4. Operating a more weather sensitive facility.
5. Allowing for a greater capability of central monitoring and troubleshooting via remote.
6. Greater operating flexibility to reduce costs and optimize staff efficiency.

Indoor Air Quality

Implementation of new energy-related standards and practices has contributed to a degradation of indoor air quality. In fact, the quality of indoor air has been found to exceed the Environmental Protection Agency (EPA) standards for outdoor air in many homes, businesses, and factories.

The American Council of Governmental Industrial Hygienists (ACGIH) in their booklet "Threshold Limit Values," has published air quality standards for the industrial environment. No such standards currently exist for the residential, commercial, and institutional environments, although the ACGIH standards are typically and perhaps inappropriately used. The EPA has been working to develop residential and commercial standards for quite some time.

Recent studies indicate that for even the healthiest students, indoor air pollution can reduce the ability to learn. As an example, if you were to place several students in a room where it's hot, there's little or no air circulation and other children are coughing and sneezing, exposing the student body to airborne related illnesses such as the cold or flu. Honeywell has addressed this issue by focusing on the proper operation and replacement of the unit ventilators and air handler equipment which will assure IAQ standards are met.

ECM 1A INTERIOR LIGHTING UPGRADES – LED RETROFIT

The key benefits of this ECM include:

- Energy Savings from reducing total energy consumption with more efficient, state of the art technology. Today's most efficient way of illumination and lighting has an estimated energy efficiency of 80%-90% when compared to traditional lighting and conventional light bulbs.
- Improved teacher and student performance from enhanced lighting quality that translates to an enhanced working and learning environment.
- Improved equipment longevity by reducing amount of light usage and extending the useful life of your lighting system. LED bulbs and diodes have an outstanding operational life time expectation of up to 100,000 hours. This is 11 years of continuous operation, or 22 years of 50% operation. Operational savings in terms of bulb and ballast replacement are significant based on this technology.
- Reduced maintenance and operational costs by modernizing your lighting system and providing for longer lasting and technologically advanced lights, without the need to address deficient or bad ballasts.
- Ecologically Friendly - LED lights are free of toxic chemicals. Most conventional fluorescent lighting bulbs contain a multitude of materials like mercury that are dangerous for the environment. LED lights contain no toxic materials and are 100% recyclable, and will help to reduce carbon footprint by up to a third. The long operational life time span mentioned above means also that one LED light bulb can save material and production of 25 incandescent light bulbs. A big step towards a greener future!

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
1A LED Lighting	✓	✓	✓	✓	✓	✓	✓	✓

Existing Conditions

Indoor lighting predominantly consists of standard T-8s and some, CFLs and few incandescent bulbs. In general lighting is operated on switches; however, some rooms have occupancy sensors. Outdoors lighting consists of wall mounted CFLs and the parking lot has post mounted HPS.

Scope of Work

The proposed lighting system is based on the recent investment grade lighting system audit where existing lighting systems were analyzed and inventoried. Honeywell proposes to retrofit all existing T-8 and T-12 fixtures with high efficiency Light Emitting Diode (LED) lamps.

The School District will receive many benefits from the lighting system upgrade.

Examples of existing lighting

LED Parking Lot Lighting Upgrades

Existing Conditions

The School District parking lots consist of various types of HID light fixtures, which are not as efficient as modern LED types. Parking lot exterior lights consist of pole mounted shoe-box type and wall pack HID fixtures on daylight sensors and timers.

Example of existing outdoor lighting fixtures.

Scope of Work

Outdoor Lighting

The exterior wall-packs and pole-mounted shoebox fixtures are currently high wattage HID lamps. These will be replaced with lower wattage LED fixtures. The LED technologies offer significant advantages such as extended lamp life, minimal lumen depreciation, "instant on," and very high energy conversion efficiency. These fixtures will provide substantial maintenance savings via the new 100,000 hour LED lamp life versus the 20,000 hours of the existing metal halide lamps.

To retrofit these lights with energy efficient LEDs, the existing ballasts that are in the space behind the light will be removed. Once removed, replace them with LED drivers which will use approximately 24V and will not need the existing ballast. The existing lamps are removed and new energy efficient LED lamps are installed in their place. Replacements or maintenance is not required on these type fixtures for up to 100,000 hours or 15-20 years depending on usage time.

Changes in Infrastructure

New LED lamps will be installed as part of this ECM. Existing poles and shoe box fixtures will be utilized.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage. A slight increase in heating energy is resultant from the reduced heat output of more efficient lamps.
Waste Production	All lamps and ballasts that are removed will be properly disposed.
Environmental Regulations	No environmental impact is expected.

ECM 1B LIGHTING CONTROLS / BMS INTEGRATION

The key benefits of this ECM include:

- Energy Savings and improved equipment longevity by reducing amount of light usage and extending the useful life of your lighting system. LED bulbs and diodes have an outstanding operational life time expectation of up to 100,000 hours. This is 11 years of continuous operation, or 22 years of 50% operation. Operational savings in terms of bulb and ballast replacement are significant based on this technology.

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
1B Lighting Controls	✓	✓	✓	✓	✓	✓	✓	✓

Existing Conditions

Educational institutions, such as K- 12 Districts, are focused on providing classrooms and campuses for their teachers and students that are safe, healthy, energy-efficient and provide the best environment for learning. And they are also chartered with reducing the costs of building operations. Current conditions do not allow for remote operation of the lighting systems within the buildings.

Solution

Honeywell proposes to install additional JACE Controllers to be integrated with the Honeywell District Building Management and tied into the lighting circuits to provide BMS Control of the lighting systems and help the District achieve its goals.

Examples of existing lighting

Example of Honeywell JACE (Java Application Control Engine) Controllers

Scope of Work

Integrate of JACE Controller System to Interface with BMS

The system acts like the extension for the building and helps give you more control of your facilities. With this integration, the buildings are more efficient.

An integrated Lighting Control System Can Lower Energy Costs from lighting:

Exterior lighting controls lower cost based on custom-tailored settings.

Lower Maintenance Costs:

Based on reducing the runtime of lighting equipment.

Changes in Infrastructure

Exterior/parking lot lighting control and BMS integration components will be installed as part of this measure.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage. A slight increase in heating energy is resultant from the reduced heat output of more efficient lamps.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

ECM 1C DE-STRATIFICATION FANS

The key benefits of this ECM include:

- **Improved efficiency & energy savings** through more equal distribution of conditioned air
- **Equipment longevity** due to lower utilization of equipment to condition the air
- **Increased comfort** of occupants to improve educational performance of students and teachers

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
1C De-Stratification Fans	✓	✓	✓	✓	✓	✓	✓	

Existing Conditions

Warm air stratifies close to the ceiling in high ceiling areas such as in a gymnasium or auditorium. Elevated levels of heat transfer through the upper walls and roof causes increased heat loss.

Examples of high-bay gymnasiums

Proposed Solution

In areas with 15+ foot ceiling heights, there is approximately a 10°F+ temperature difference between the floor and the ceiling. With higher ceilings, it is even greater. That means to generate the heat necessary to maintain a comfortable 70°F temperature at the floor level, where student activities occur, the ceiling could be 80°F or higher.

De-stratification fans de-stratify the air to a zero to 3°F differential from floor to ceiling and wall to wall. This will allow HVAC systems to run for a shorter duration because of the absence of extreme temperatures to heat or cool, thus allowing the local thermostats to be satisfied for longer periods of time.

Systems Evaluation and Selection

An energy-efficient motor drives a near-silent fan that forces a column of hotter air from the ceiling area to the cooler floor below. As this column of warm air nears the floor, it begins to flare out in a circular pattern and rise again. While doing so, it warms the cooler air and mixes with air near the floor, increasing the temperature and comfort of occupants. Through a natural law of physics, this process will continue to re-circulate air, mixing warmer air from the ceiling with cooler air near the floor until the ceiling and air temperatures are nearly equal. As this happens, it will require less and less energy to comfortably heat the area, allowing thermostats to be lowered and energy savings to be realized. Once started, the entire process of "thermal equalization" will take on average less than 24 hours.

Based on the investment grade audit conducted by our staff, we propose to install the following as indicated in the table below:

School	Location	Qty	Type
William Mason Elementary School	Multi-Purpose Room	4	Air Pear 25
Cedar Hill Elementary School	Multi-Purpose Room	4	Air Pear 45
Cedar Hill Elementary School	Cafeteria	2	Air Pear 25
Valley View Elementary School	Multi-Purpose Room	4	Air Pear 25
Hilldale Elementary School	Multi-Purpose Room	4	Air Pear 25
Woodmont Elementary School	Multi-Purpose Room	4	Air Pear 25
Lazar Middle School	Cafeteria	4	Air Pear 25
Lazar Middle School	Gym	6	Air Pear 25
Montville High School	Wrestling Room	4	Air Pear 25
Montville High School	Old Gym	8	Air Pear 25
Total		52	

Table 1C.1 – Proposed De-Stratification Fans

Scope of Work

Per De-Stratification Fan:

- Shut off the main electric power to the area in which the unit(s) will be installed.
- Install new de-stratification fan and wiring.
- Re-energize.
- Inspect unit operation by performing electrical and harmonics testing.

Changes in Infrastructure

New de-stratification fans will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced thermal energy usage. A slight increase in electrical energy is resultant from the increase run time of the fan motors.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

ECM 1D VENDING MISERS

The key benefits of this ECM include:

- **Energy Savings** by better managing the power consumption of electrical equipment.
- **Longer equipment life** thanks to reduced usage based on local occupancy.

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
1D Vending Misers	✓	✓	✓	✓	✓	✓	✓	✓

The District has vending machines at multiple locations. As such, Honeywell has investigated the use of occupancy-based controllers for these machines.

Existing Conditions

Vending machines are located throughout your facilities offering snacks and soft drinks to the occupants. A typical cold drink machine consumes over 5,000 kWh annually.

Existing Vending Machines in High School and Middle School

Building	Type	Location	Qty
Montville High School	Cold Beverage	Cafeteria	1
Montville High School	Cold Beverage	Cafeteria	1
Montville High School	Cold Beverage	Cafeteria	1
Montville High School	Cold Beverage	Cafeteria	1
Montville High School	Cold Beverage	Cafeteria	1
Montville High School	Cold Beverage	Cafeteria	1
Montville High School	Cold Beverage	Auditorium	1
Montville High School	Cold Beverage	Auditorium	1
Montville High School	Snack	Auditorium	1
Lazar Middle School	Cold Beverage	Cafeteria	1
Lazar Middle School	Cold Beverage	Cafeteria	1
Lazar Middle School	Snack	Cafeteria	1
Lazar Middle School	Cold Beverage	Cafeteria	1
Lazar Middle School	Cold Beverage	Cafeteria	1
Valley View Elementary School	Cold Beverage	Teachers Room	1
Woodmont Elementary School	Cold Beverage	Teachers Room	1

Building	Type	Location	Qty
Hilldale Elementary School	Cold Beverage	Teachers Room	1
Cedar Hill Elementary School	Cold Beverage	Teachers Room	1
Cedar Hill Elementary School	Snack	Teachers Room	1
William Mason Elementary School	Cold Beverage	Teachers Room	1
Administration Building	Cold Beverage	Break Room	1
Total			21

Table 1D.1 – Existing Vending Machines

Proposed Solution

During the site visit, Honeywell noted multiple vending machines, providing an opportunity for energy savings by shutting off these loads during the non-occupied periods.

The Vending Machine Occupancy Control, or VMOC, also monitors electrical current used by the vending machine. This ensures that the unit will never power down a vending machine while the compressor is running, so a high head pressure start never occurs. In addition, the current sensor ensures that every time the vending machine is powered up, the cooling cycle is run to completion before again powering down the vending machine. The Coca Cola Company and Pepsi Corporation approve the proposed controller for use on their machines.

Interface with Existing Equipment

All of the VMOC devices are easily installed. The vending machine controllers are installed separately from the machine, and implementation will occur during working hours. A period of three (3) weeks will be required to verify proper calibration of the sensors.

With respect to the vending machines in your facilities, Honeywell has estimated the number and types of vending machines based on our site tour. During the implementation phase, Honeywell will check with the vendor about the type and specification of the vending machines as it relates to any internal time clocks which may exist inside the machine. Should this be the case, the savings and cost will be adjusted accordingly.

Changes in Infrastructure

New vending machine controls will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Minor coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

ECM 1D PLUG LOAD MANAGEMENT

The key benefits of this ECM include:

- **Energy Savings** by better managing the power consumption of electrical equipment.
- **Longer equipment life** thanks to reduced usage based on building schedules.

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
1E Plug Load Management	✓	✓	✓	✓	✓	✓	✓	✓

Existing Conditions

All of your buildings are equipped with a host of equipment and devices. A byproduct of the electronic devices such as printers, projectors, televisions, window air conditioning units, and vending machines is their phantom load. Phantom load refers to energy that is used when a device is off. This includes energy used by TV's and copiers when they're in standby mode (i.e. when they can be turned on with a remote), and energy used by chargers or a laptop's AC adapter. Studies estimate that phantom load now accounts for 6% of all energy use. This measure will address energy waste due to phantom loads in your buildings.

Typical electrical draws for when devices are off are as follows:

Examples of existing plug-loads

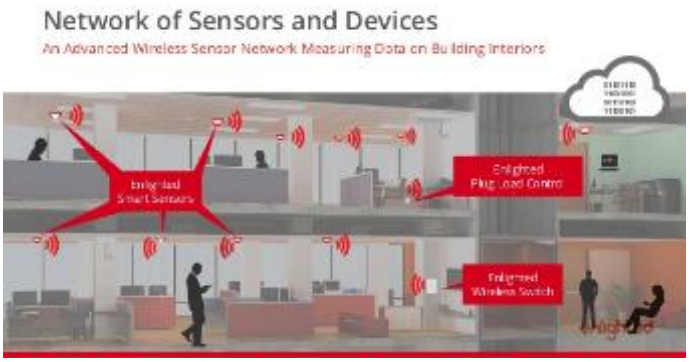
Device	Wattage
Large Copiers	30
Small Printers / Copiers	20
Monitor Combos (Printer)	30
Laptop Charging Carts	35
Projectors	21
Water Fountains	6
Coffee Machines	60
Hot / Cold Water Machines	60

Table 1D. 1 – Electrical Draw per Typical Device

Proposed Solution

Honeywell proposes to install plug load management via Wi-Fi to provide a comprehensive solution to the device control dilemma, by using an existing Wi-Fi network. This computer-based system is designed to allow you to program or control your devices with

a customizable schedule. These plugs are in essence a switch that stops all electrical power to the device, turning off equipment and eliminating phantom loads, and are a proven technology with a high degree of reliability and security.



The Plug Load Controller enables energy savings by controlling plug loads through occupancy or schedule-based on/off control of receptacles on a circuit. The device is paired with a sensor or a group of sensors in the network to enable occupancy-based control. The controller features two sets of wires to separately power controlled and uncontrolled outlets, so that energy consumption on both uncontrolled and controlled circuits are separately measured. plug.

Energy Savings Methodology and Results

Installation of the controls will reduce the operating hours of the connected peripheral devices reducing electrical consumption.

Changes in Infrastructure

Peripherals will be connected new control devices permitting peripheral operation to be coordinated with the computer to which they are connected.

Customer Support and Coordination

None.

Environmental Issues

Resource Use	Annual savings for student computers are based wattage difference between the two monitor types.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

ECM 2A 500 & 600 WING AIREDALE REPLACEMENTS

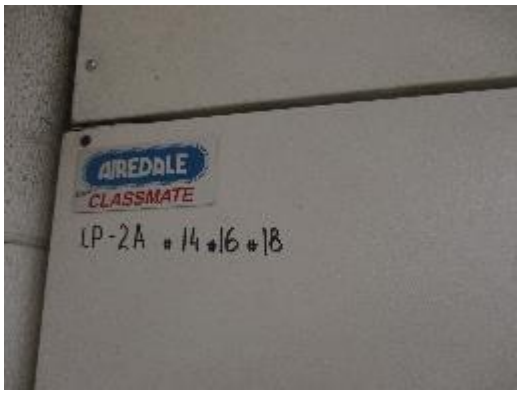
The key benefits of this ECM include:

- **Reduced energy usage** from improved efficiency thanks to replacement of older equipment
- **Lower operational costs** through less frequent maintenance and operational issues

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2A 500 & 600 Wing Airedale Replacements				✓				

Existing Conditions

Airedale wall units serving classrooms are inefficient and have exceeded their expected useful service lives. Replacing these units with new, high efficiency units will save energy costs over the long term while reducing repair costs that would otherwise have been necessary to keep the old units in operation.



School	Make	Model	Location Served	Qty.	Tons
Montville High School	Airedale	CMX-4	New Section Classrooms/Offices	6	3.0
Montville High School	Airedale	CMX-2	New Section Classrooms/Offices	5	2.0
Montville High School	Airedale	CM5X	New Section Classrooms/Offices	10	4.0

Table 2A.1 – Existing Units to be re-placed

Proposed Solution

Honeywell proposes replacing the existing Airedale Classroom units in Table 2K.1. The new high efficiency Modine units will be installed in the same location as the existing units. The units will replace the existing units serving the identified classroom locations. The new units will be equipped with factory-installed microprocessor controls that improve unit efficiency. The units will also communicate with the existing building management system.

School	Make	Model	Location Served	Qty.	Tons
Montville High School	Modine	CMD36	New Section Classrooms/Offices	6	3.0
Montville High School	Modine	CMD24	New Section Classrooms/Offices	5	2.0
Montville High School	Modine	CMD36	New Section Classrooms/Offices	10	4.0

Table 2A.2 – Proposed Units

Scope of Work

The following outlines the scope of work to install the equipment stated in the above table:

- Disconnect existing Airedale electric connections.
- Disconnect piping and air ducts from the unit.
- Remove unit from the base.
- Modify base for new unit if necessary.
- Rigging and setting new unit at the base.
- Inspect piping and air ducts before reconnecting them to the unit.
- Reconnect piping and air ducts.
- Repair duct and piping insulation.
- Connect electric power.
- Start up and commissioning of new unit.
- Maintenance operator(s) training.

Energy Savings Methodology and Results

The savings approach is based on the energy efficiency between the existing and new units. The savings are generally calculated as:

Electric Energy savings	Existing unit energy consumption (kWh) – replacement unit energy consumption (kWh)

Equipment Information

Manufacturer and Type	Modine CMD
Equipment Identification	Product cut sheets and specifications are available upon request. As part of the measure, design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency units.
Waste Production	Existing unit scheduled for removal will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 2B 500 & 600 Wing VRV Replacements/Airedale Refurbishment

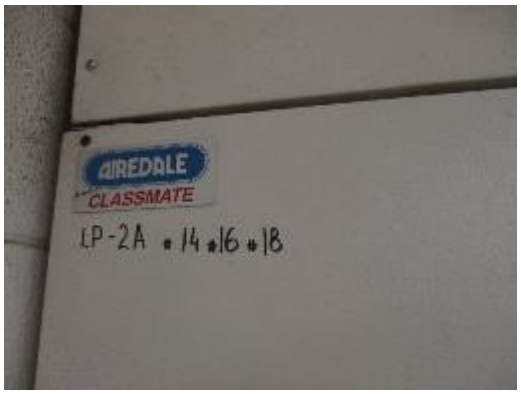
The key benefits of this ECM include:

- **Reduced energy usage** from improved efficiency thanks to replacement of older equipment
- **Lower operational costs** through less frequent maintenance and operational issues

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2B 500 & 600 Wing VRV Replacement				✓				

Existing Condition

Montville High School 500 & 600 Wings Airedale Units have issues with DX cooling and have been modified by School District to supply adequate cooling to classrooms.



School	Make	Model	Location Served	Qty.	Tons
Montville High School	Airedale	CMX-4	New Section Classrooms/Offices	6	3.0
Montville High School	Airedale	CMX-2	New Section Classrooms/Offices	5	2.0
Montville High School	Airedale	CM5X	New Section Classrooms/Offices	10	4.0

Table 2B.1 – Existing Units to be re-placed

Proposed Solution

Honeywell proposes to install Variable Refrigerant Volume (VRV) systems in lieu of the Airedale Cooling units and to supplement existing heating systems at the District Schools. Fan coils units would need to be installed in each of the room. Air-cooled condensing units would need to be installed outdoors. Several fan coil units can be connected to a single condensing unit. Refrigerant piping will be connected from the outdoor condensing units to the indoor fan coil units. Each zone receives its own controller and sensor enabling personalized comfort. Quiet operation, energy savings and flexibility of installation and use, are a few features of the VRV systems.

VRV Heat Pump technology is an applied cooling/heating system that distributes refrigerant to fan coil units in conditioned spaces. The condensing units have high efficiency variable speed "inverter" compressors coupled with inverter fan motors for superior system part load performance. The compressor capacity is modulated automatically to maintain a constant suction pressure, while varying the refrigerant volume to deliver precisely the needs of the cooling or heating loads.

School	Make	Location Served	Qty.	Tons
Montville High School	Daikin	New Section Classrooms/Offices	6	3.0
Montville High School	Daikin	New Section Classrooms/Offices	5	5.0
Montville High School	Daikin	New Section Classrooms/Offices	10	4.0

Table 2B.2 – Proposed Units

Scope of Work

The following outlines the scope of work to install the VRV Systems stated in the above table:

- Install condensing units and fan coil units
- Install refrigerant and condensate piping
- Retro _Commission Existing Airedale Heating Sections for Efficient Operation
- Connect electric power
- Start up and commissioning of new units

Maintenance operator(s) training Energy Savings Methodology and Results

The savings approach is based on the energy efficiency between the existing and new units. The savings are generally calculated as:

Electric Energy savings	Existing unit energy consumption (kWh) – replacement unit energy consumption (kWh)

Equipment Information

Manufacturer and Type	Daikin VRV
Equipment Identification	Product cut sheets and specifications are available upon request. As part of the measure, design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency units.
Waste Production	Existing unit scheduled for removal will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 2C ROOFTOP UNIT REPLACEMENTS

The key benefits of this ECM include:

- **Improved efficiency & energy savings** through replacement of old, end of useful life equipment
- **Equipment longevity** due to more efficient and less wasteful equipment utilization

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2C RTU Replacements				✓	✓		✓	

Existing Conditions

Some Rooftop Units (RTUs) serving the schools marked above are inefficient or past their useful lives. Replacing these units with new, high efficiency units will save energy costs over the long term while reducing repair costs that would otherwise have been necessary to keep the old RTUs in operation.

School	Make	Model	Location Served	Qty.	Tons
Valley View Elementary School	Seasons4	6MHE20-0241-HW3.6-09SE	Library & 2nd floor core classrooms	1	20.0
Valley View Elementary School	Seasons4	6MHE20-0241-HW3.6-09SE	Library & 2nd floor core classrooms	1	20.0
Woodmont Elementary School	Carrier	50CD006500	Room 23	1	5.0
Woodmont Elementary School	Carrier	50CD006500	Room 22	1	5.0
Woodmont Elementary School	Carrier	50CD008500	Room 20	1	7.5
Montville High School	TRANE	TCD103B40ADA	Chorus	1	8.5
Montville High School	TRANE	TCD103B40ADA	Band Room	1	8.5

Table 2C. 1 – Existing Rooftop Units to be Replaced

Proposed Solution

Honeywell proposes replacing the existing rooftop units in the above Table. The new units will be installed in the same location as the existing units. Existing electrical power supply will be reconnected to the new motors. The new units will be equipped with factory-installed microprocessor controls that improve unit efficiency. The units will also communicate with the building management system.

School	Make	Model	Location Served	Qty.	Tons
Valley View Elementary School	Lennox	LCH240U4M	Library & 2nd floor core classrooms	1	20.0
Valley View Elementary School	Lennox	LCH240U4M	Library & 2nd floor core classrooms	1	20.0
Woodmont Elementary School	Lennox	LCH060U4E	Room 23	1	5.0
Woodmont Elementary School	Lennox	LCH060U4E	Room 22	1	5.0
Woodmont Elementary School	Lennox	LCH094U4E/M	Room 20	1	7.5
Montville High School	Lennox	LCH094U4E/M	Chorus	1	7.5
Montville High School	Lennox	LCH094U4E/M	Band Room	1	7.5

Table 2C. 2 – Proposed Rooftop Units

Scope of Work

The following outlines the scope of work to install the rooftop units stated in the above table:

- Disconnect existing RTU electric connections.
- Disconnect piping and air ducts from the unit.
- Remove unit from the base.
- Modify base for new unit if necessary.
- Run new gas line for gas fired heater.
- Rigging and setting new unit at the base.
- Inspect piping and air ducts before reconnecting them to the unit.
- Reconnect piping and air ducts.
- Repair duct and piping insulation.
- Connect electric power.
- Start up and commissioning of new unit.
- Maintenance operator(s) training.

Energy Savings Methodology and Results

The savings approach is based on the energy efficiency between the existing and new units. The savings are generally calculated as:

Electric Energy savings	Existing unit energy consumption (kWh) – replacement unit energy consumption (kWh)

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the School District will determine final selections.
Equipment Identification	Product cut sheets and specifications are available upon request. As part of the measure, design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency units.
Waste Production	Existing rooftop unit scheduled for removal will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 2D MOTOR AND VFD REPLACEMENTS

The key benefits of this ECM include:

- **Energy Savings** from reduced run hours and reduced motor speeds
- **Equipment longevity** due to more efficient and less wasteful equipment utilization and reduced startup wear

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2D Motor and VFD Replacements	✓	✓	✓	✓	✓		✓	

ECM Overview

Variable frequency drives (VFDs) allow motors to run at specified speeds rather than just on or off while allowing systems to more accurately move heat. Honeywell recommends this ECM due to the significant savings potential given the relationship between energy consumption and motor speed.

Examples of existing motors and pumps

Existing Conditions

Honeywell has identified standard efficiency electric motors on several pumps. Energy savings can be obtained by replacing the standard efficiency motors with premium efficiency motors as well as by installing Variable Frequency Drives on systems that have two-way control valves.

The motors that were identified in the buildings are listed as follows:

Building	Equipment Description	Qty	Motor HP	Replace Motor Y/N	Add VFD Y/N
Montville High School	Boiler Pump	2	20.0	Y	Y
Montville High School	Boiler Pump	2	20.0	Y	Y
Montville High School	Zone Pump	2	15.0	Y	Y
Hilldale Elementary School	Zone pump	2	10.0	Y	Y
Lazar Middle School	Boiler Pump	2	7.5	Y	Y
Valley View Elementary School	Boiler Pump	2	7.5	Y	Y
Montville High School	Zone Pump	2	5.0	Y	Y
Woodmont Elementary School	Zone Pump	2	5.0	Y	Y
Cedar Hill Elementary School	Zone Pump	2	5.0	Y	Y
Cedar Hill Elementary School	Boiler Pump	2	1.5	Y	N

Table 2D. 1 – Existing Motors and Replacements

Proposed Solution

Honeywell identified a number of your buildings have hydronic systems, and the motors that serve them that are sized to meet peak heating or cooling conditions. However, we've learned that most operating hours occur during conditions that require less than peak loads.

Honeywell proposes replacing of all above-mentioned single speed standard efficiency motors (that do not have VFDs) with new premium efficiency motors, installing new couplings where applicable. In addition, Honeywell recommends installing VFDs on some of these pumps. Energy used by the motor can be reduced by varying the flow in response to varying loads in the space. Motor speed may be controlled either based on the pressure in the distribution system or based on time of day.

Honeywell recommends fitting unit ventilators with two way valves (provided that unit ventilators located at end of piping branches are fitted with three-way valves to keep hot water moving through the distribution piping at all times).

Honeywell also recommends installing VFDs on the heating hot water pumps and chilled water pumps to better match pumping output to system requirements and reduce energy waste. Honeywell also recommends installation of new differential pressure sensors and tying them to the control system to allow you to regulate the speed of the pump according to load requirements. VFDs will maintain temperatures by adjusting the speed of both the motor and the pump, and can be connected to your BMS.

Energy Savings Methodology and Results

The energy consumed by electric motors varies with the cube of the motor speed. Variable speed drives reduce motor speed (in response to load) thus reducing energy consumption exponentially.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the School District will determine final selections.
Equipment Identification	Product cut sheets and specifications for generally used selections are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New motors will be installed in place of the old motors. No expansion of the facilities will be necessary.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will also be required.

Environmental Issues

Resource Use	Energy savings will result from reducing electrical usage by operating higher efficiency motors for the same horsepower output. The equipment uses no other resources.
Waste Production	This measure will produce waste byproducts. Old motors shall be disposed of in accordance with all federal, state and local codes.
Environmental Regulations	No environmental impact is expected.

ECM 2E SPLIT SYSTEM REPLACEMENT

The key benefits of this ECM include:

- **Energy Savings** from reducing total energy consumption
- **Equipment longevity** due to more efficient and less wasteful equipment utilization
- **Operational savings** from less frequent need to repair or replace key HVAC equipment thanks to less frequent equipment use

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2E Split System Replacements				✓	✓			

Existing Conditions

Honeywell identified condensing units in some of your buildings as being inefficient and having exceeded their useful service life. Replacing these units with new, high efficiency units will save energy costs over the long term while reducing repair costs that would otherwise have been necessary to keep the old units in operation.

Valley View Condensing Unit

Montville HS Condensing Unit

Building	Make	Model	Location Served	Qty.	Tons	SEER
Montville High School	Airdale	Unknown	Tech Room	1	5.0	9.0
Montville High School	Carrier	38AKS044	Auditorium	1	40.0	10.5
Montville High School	Carrier	38AKS034	Auditorium	1	28.0	10.7
Valley View Elementary School	York	HBHB-W120AE	First floor offices	1	10.0	9.6

Table 2E.1 – Existing Split System Units to be Re-placed

Proposed Solution

Honeywell proposes replacing the existing condensing units in the table above. The new units will be installed in the same location as the existing units. Existing electrical power supply will be reconnected to the new units. The new units will be equipped with factory-installed microprocessor controls that improve unit efficiency. The units will also communicate with the existing or enhanced building management system.

Building	Make	Model	Location Served	Qty.	Tons	SEER
Montville High School	Daikin	RCS-06	Tech Room	1	6.0	11.8
Montville High School	Daikin	RCS-040	Auditorium	1	40.0	12.1
Montville High School	Daikin	RCS-030	Auditorium	1	30.0	11.5
Valley View Elementary School	Daikin	RCS-010	First floor offices	1	10.0	11.0

Table 2E.2 – Proposed Split Systems

Scope of Work

The following outlines the scope of work to install the condensing units stated in the above table:

- Disconnect existing electric connections.
- Disconnect piping from the unit.
- Remove unit from the base.
- Modify base for new unit if necessary.
- Rigging and setting new unit at the base.
- Inspect piping and air ducts before reconnecting them to the unit.
- Reconnect piping and air ducts.
- Repair duct and piping insulation.
- Connect electric power.
- Start up and commissioning of new unit.
- Maintenance operator(s) training.

Energy Savings Methodology and Results

The savings approach is based on the energy efficiency between the existing and new units. The savings are generally calculated as:

Electric Energy savings	Existing unit energy consumption (kWh) – replacement unit energy consumption (kWh)

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the customer will determine final selections.
Equipment Identification	Product cut sheets and specifications are available upon request. As part of the measure, design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency units.
Waste Production	Existing units scheduled for removal will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 2F DOMESTIC HOT WATER SYSTEM REPLACEMENTS

The key benefits of this ECM include:

- **Reduced energy usage** from improved efficiency thanks to replacement of older equipment
- **Lower operational costs** through less frequent maintenance and operational issues

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2F DHW Replacement			✓	✓				

Existing Conditions

The existing domestic hot water heaters are generally in good condition but are not high-efficiency units.

Existing Domestic Hot Water Units

Building	Manufacturer	Model	Qty	Capacity MBH	Storage (Gal)	Fuel
Montville High School	Lochinvar	PFN1002PM	2	1,000	600	Gas
Lazar Middle School	Rheem	G65-360A	2	360	65	Gas

Table 2F.1 – Existing Equipment

Proposed Solution

Honeywell proposes replacing the existing DHW heaters at the above schools with highly efficient condensing DHW heaters. New condensing DHW heaters have efficiencies between 92% - 94%. They provide better control with capabilities as night setback, temperature adjustments and demand control hot water.

Building	Manufacturer	Model	Qty	Capacity MBH	Storage (Gal)	Fuel
Montville High School	Lochinvar	AWN801	2	800	600	Gas
Lazar Middle School	AO Smith	BTH-300	1	300	100	Gas

Table 2F.2 – Proposed Equipment

**High School Storage Tanks to be reused.*

Scope of Work

The following outlines the domestic hot water heater replacement:

- Demolish and remove old water heaters
- Furnish and install condensing gas fired domestic hot water heaters as specified in the table above

- Install all required piping, controls, and breeching
- Install mixing valve
- Install circulators for building use
- Test and commission

Energy Savings Methodology and Results

The savings are calculated from the domestic hot water heater efficiency differences.

Existing Equipment Efficiency	= Efficiency of the Existing Domestic Hot Water Heater
Proposed Equipment Efficiency	= Efficiency of the New Domestic Hot Water Heater
Energy Savings	= DHW Load x (Existing Equipment Efficiency – New Equipment Efficiency)

Changes in Infrastructure

New Domestic Hot Water heaters will be installed in place of the old Domestic Hot Water heaters. No expansion of the facilities will be necessary.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the Customer will determine final selections.
Equipment Identification	As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from improved thermal efficiency.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

Utility Interruptions

Proper phasing procedures will minimize gas interruptions.

ECM 2G PIPE INSULATION

The key benefits of this ECM include:

- Energy Savings from reducing heat losses from uninsulated pipes

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2G Pipe Insulation					✓			

Existing Conditions

An insulation audit was conducted identifying an approximated quantity of heat that is lost from various locations throughout the buildings. The heat losses result from hot piping giving off heat to the space around it. This measure will insulate these surfaces, resulting in energy savings and improved comfort of those areas in or near occupied spaces.

During the site visits, it was noticed that hot water piping and valves in boiler rooms were not insulated. The un-insulated piping and valves waste energy and also pose a danger of getting injured with exposed hot piping. In addition, water heating equipment has to work harder to make up for the wasted energy.

Examples of missing pipe insulation

Proposed Solution

Honeywell proposes insulating these pipes and valves with appropriately sized fiberglass insulation. The following table lists the recommended insulation thickness.

Location	Pipe Diameter	Linear Feet of Pipe
Valley View Elementary School	1.0”	20
Valley View Elementary School	1.5”	20

Table 2G.1 – Pipe Insulation to be Installed

Energy Savings Methodology and Results

Energy savings results from significantly reducing the heat lost to the atmosphere from the piping and valve surfaces. In general, Honeywell uses the following approach to determine savings for this specific measure:

Energy Savings $	= ((Heat Loss Rate per foot of Uninsulated Pipe – Heat Loss Rate per foot of Insulated Pipe) x (Length of Pipe x Hours of Operation) x Cost/btu)/(Boiler Efficiency))

Reference is made to the ASHRAE 1989 Fundamentals text page 22.19, Table 9A "Heat Loss from Bare Steel Pipe to Still Air at 80 degrees F, Btu/hr-ft" for losses from un-insulated lines, and Table 11 "Recommended Thickness for Pipe and Equipment Insulation".

Changes in Infrastructure

The insulation of hot piping can happen anytime without impact on building operation. In areas were asbestos is present; precautions will be required. Areas that are dangerously hot may require coordination with a normally occurring shutdown of that portion of the system.

Customer Support and Coordination with Utilities

The service to the specific lines may require interruption to allow for the repair or replacement. Coordination with site personnel will be required to minimize interruption to the buildings affected.

Environmental Issues

Resource Use	Energy savings will result the reduction of heat loss from uninsulated lines resulting in lower fuel consumption. The equipment uses no other resources.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	Asbestos abatement may be required

ECM 2H KITCHEN HOOD CONTROLS

The key benefits of this ECM include:

- **Reduced energy usage** from decreasing operating hours of kitchen hood exhaust fans
- **Lower operational costs** through less frequent maintenance and operational issues

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2H Kitchen Hood Controls			✓	✓				

Existing Conditions

Honeywell observed kitchens utilizing a constant volume kitchen exhaust hood system. This system operates at full load, even when there is no activity in the kitchen. It also requires operating the exhaust fan at full load. This wastes both fan energy and heating energy. When the hood is not utilized, an opportunity exists to reduce airflow and conserve energy.

Montville HS – Kitchen Hood

Lazer MS – Kitchen Hood

Proposed Solution

Honeywell recommends installing a microprocessor based controls system whose sensors automatically regulate fan speed based on cooking load, time of day and hood temperature while minimizing energy usage. The system includes a temperature sensor installed in the hood exhaust collar, IP sensors on the ends of the hood that detect the presence of smoke or cooking effluent and variable frequency drives (VFD) that control the speed of the fans. This will result in energy and cost savings, noise reduction, longer equipment life and reduction in cleaning costs.

Building	Number of Hoods
Montville High School	1
Lazar Middle School	1

Table 2H.1 – Existing Kitchen Hoods to be installed with Controllers

Scope of Work

- Install a temperature sensor in the hood to monitor temperature of the exhaust gas
- Install a set of two photo sensors on the sides to monitor smoke density across the hood
- Install a control panel with a small point controller and a set of relays in the kitchen close to the hood

- Provide electric wiring from the new panel to the sensors, exhaust fan motor as well as to the closest electric panel for power supply
- Provide connection to the BMS system for remote monitoring, control, and alarming. This system could also be stand-alone to save on cost.
- Commission control components and sequences, and calibrate control loops.

Sequence of operation will enable the exhaust fans when either temperature or smoke density in the range hoods is above a pre-set value. Time delays between start and stop will be programmed to prevent motor short cycling. Schedule programming can be implemented as well.

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of conditioned air that is being exhausted when there is no cooking taking place.

Changes in Infrastructure

There will be improvements in HVAC equipment and controls for not operating fans continuously.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

ECM 2I Walk-In Compressor Controls

The key benefits of this ECM include:

- **Energy Savings** from reducing total energy consumption
- **Equipment longevity** due to more efficient and less wasteful equipment utilization
- **Operational savings** from less frequent need to repair or replace equipment thanks to less frequent equipment use

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
2I Walk-In Compressor Controls			✓	✓				

Existing Conditions

In many refrigeration, walk-in freezers and coolers, the compressor is oversized and cycles on/off frequently. This compressor cycling results in higher energy consumption and may reduce the life of the compressor.

Montville HS Walk-In Freezer Condenser

Montville HS Walk-In Fridge/Freezer

Building	Location	Walk-In Refrigerators	Walk-In Freezers
Montville High School	Kitchen	1	
Montville High School	Kitchen	1	
Montville High School	Kitchen		1
Lazar Middle School	Kitchen	1	
Lazar Middle School	Kitchen		1

Table 2I.1 – Existing Walk-In Refrig/Freezers to be installed with Controllers

Proposed Solution

Honeywell will install a controller refrigeration sensor manufactured by Intellydyne at the above-mentioned buildings to reduce the compressor cycles of the kitchen walk-in coolers and freezers. The installation of this ECM will have no negative impact on system operation or freezing of food products. By reducing the cycling, the sensor will improve operating efficiency and reduce the electrical consumption.

This control enhancement will save energy through the reduced compressor cycling in the kitchen walk-in coolers and freezers and will extend the operating life of the compressor. Consequently, the compressor will not have to be replaced as often.

Intellidyne Sensor Features

- Automatic restart on power failure
- Surge protection incorporated into circuitry
- Fully compatible with all energy management systems
- UL listed
- Maintenance free

Intellidyne Sensor Benefits

- Patented process reduces air conditioning electric consumption typically 10% to 20%
- Increased savings without replacing or upgrading costly system components
- "State-of-the-art" microcomputer controller – LED indicators show operating modes
- Protects compressor against momentary power outages and short cycling
- Simple 15-minute installation by qualified installer
- No programming or follow-up visits required
- Maximum year-round efficiency
- Reduces maintenance and extends compressor life
- Fail-safe operation
- Guaranteed to save energy
- UL listed, "Energy Management Equipment"

Intellidyne's patented process determines the cooling demand and thermal characteristics of the entire air conditioning system by analyzing the compressor's cycle pattern, and dynamically modifies that cycle pattern to provide the required amount of cooling in the most efficient manner. This is accomplished in real-time by delaying the start of the next compressor "on" cycle, by an amount determined by the cooling demand analysis. These new patterns also result in less frequent and more efficient compressor cycles.

Energy Savings Methodology and Results

The energy savings for this ECM is realized by the reduction in run time of the compressors and fan motors in the freezers/refrigerators.

Changes in Infrastructure

None

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from the reduced electrical consumption of the compressor.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

ECM 3A TRANSFORMER REPLACEMENTS

The key benefits of this ECM include:

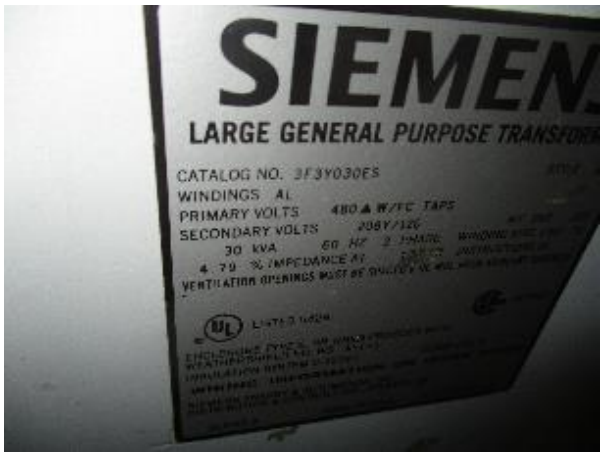
- **Energy Savings** from reducing total energy consumption with more efficient, state of the art technology
- **Equipment longevity** due to more efficient and less wasteful equipment utilization

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
3A Transformers	✓	✓	✓	✓	✓	✓	✓	

Existing Conditions

Distribution transformers throughout the School District are installed in the boiler rooms and in various electrical and utility closets to step down the voltage from 480 Volts to 120-208 Volts. Typically, an electrical distribution system has some losses, and a considerable portion of these losses are associated with distribution transformers.

Transformer at Montville HS



Transformer at Valley View

Systems Evaluation and Selection

Typical transformers are not designed to handle harmonic loads of today's modern facilities, and suffer significant losses as a result, even if the transformer is relatively new. Typically, conventional transformer losses, which are non-linear, increase by 2.7 times when feeding computer loads. The nonlinear load loss multiplier reflects this increase in heat loss, which decreases the net transformer efficiency. Also, unlike most substation transformers that are vented to the exterior, building transformers are ventilated within the building they are located, and their heat losses therefore add to the cooling load.

Based on site investigation conducted by our staff, we identified the following transformers that we propose to replace with energy efficient replacements at a size matching the existing loads as indicated in the table below:

Building	Location	kVA	Qty
Montville High School	Elec Re FEMIY Hallway	112.5	1.00
Montville High School	Old Boiler Rm	500.0	1.00
Montville High School	Old Boiler Rm	25.0	1.00
Montville High School	Room 342	30.0	1.00
Montville High School	Electric Rm by 518	112.5	1.00
Montville High School	Electric Rm by 518	75.0	1.00
Montville High School	Elec Re FEMIY Hallway	112.5	1

Building	Location	kVA	Qty
Montville High School	Old Boiler Rm	500.0	1
Montville High School	Old Boiler Rm	25.0	1
Montville High School	Room 342	30.0	1
Montville High School	Electric Rm by 518	112.5	1
Montville High School	Electric Rm by 518	75.0	1
Montville High School	New Boiler Rm	45.0	1
Montville High School	New Boiler Rm	45.0	1
Montville High School	New Boiler Rm	112.5	1
Montville High School	Electric Rm by 607 2nd FL	45.0	1
Montville High School	Electric Rm by 607 2nd FL	30.0	1
Montville High School	Electric Rm 609B	75.0	1
Montville High School	Electric Rm 609B	45.0	1
Lazar Middle School	Electric Rm outside of Library	45.0	1
Lazar Middle School	Electric Rm 4	30.0	1
Lazar Middle School	Electric Rm 5	45.0	1
Lazar Middle School	Electric Rm 6	30.0	1
Woodmont Elementary School	Electric Rm 1 by Custodian Office	75.0	1
Woodmont Elementary School	Electric Rm 4 by 18	30.0	1
Hilldale Elementary School	Electric Rm 4 in Library	30.0	1
Hilldale Elementary School	Electric Rm 4 in Library	75.0	1
Hilldale Elementary School	Copy Rm	30.0	1
Valley View Elementary School	Gym Storage	75.0	1
Valley View Elementary School	Boiler Rm	112.5	1
Valley View Elementary School	2nd FL Electric Rm 6	30.0	1
Valley View Elementary School	2nd FL Electric Rm 5 by 24	30.0	1
Cedar Hill Elementary School	Electric Rm 3 by 13	75.0	1
William Mason Elementary School	Electric Rm 4 by Custodian Office	75.0	1
William Mason Elementary School	Electric Rm 4 by Custodian Office	30.0	1

Table 3A.1 – Existing Transformers to be Replaced

Proposed Solution

The proposed transformers will be Power Smiths High Efficiency K-Star Harmonic Mitigating units. They are Energy-Star rated and meet the new TP1 Law requiring replacement of transformers of 600 volts or under.

Scope of Work

Remove old transformers and install new high efficiency transformers

Per Transformer Unit:

1. Shut off the main electric power to the transformer to be replaced.
2. Disconnect the existing transformer and install replacement unit.
3. Turn power back on.
4. Inspect unit operation by performing electrical and harmonics testing.
5. Dispose of old transformers properly.

Energy Savings Methodology and Results

The energy savings for this ECM is realized by reduction in electric energy lost in the existing transformers as a result of the higher efficiency of the new transformers.

Changes in Infrastructure

New transformers, where indicated.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of services for the affected areas.

Environmental Issues

Resource Use	Energy savings will result from increased voltage conversion efficiency.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	No environmental impact is expected.

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ECM 4A BUILDING ENVELOPE IMPROVEMENTS

The key benefits of this ECM include:

- **Energy Savings** from reducing unwanted outside air infiltration
- **Equipment longevity** due to more efficient and less wasteful equipment utilization
- **Occupancy comfort and productivity** by way of enhanced temperature and humidity control throughout your buildings
- **Improved building envelope** from addressing building gaps that allow unconditioned air penetration

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
4A Building Envelope Improvements	✓	✓	✓	✓	✓	✓	✓	✓

Existing Conditions

Heat loss due to infiltration is a common problem, particularly in places with long and cold winter seasons such as New Jersey. This problem has been shown to represent the single largest source of heat loss or gain through the building envelopes of nearly all types of buildings. Our work has found 30% to 50% of heat loss attributable to air leakage in buildings.

During our building examination, Honeywell uncovered several leaks that allow for heat loss to occur during the winter season and unwanted heat gains during the summer season. These problems include door gaps, exhaust fans in poor condition, open windows or windows in poor condition, lack of air sealing and insulation.

Honeywell has helped customers such as you to address these problems with a comprehensive and thorough building envelope solution that seals up your buildings to improve occupancy comfort and help eliminate unwanted energy waste. We propose to conduct a comprehensive weatherization job to weatherproof doors and windows, caulk and seal leaks, and install spray foam and rigid foam boards to stop unwanted air movement and provide a thermal barrier between spaces. Part of this process may include decoupling floor-to-floor and compartmentalizing of components of the building in order to equalize pressure differences.

Existing opportunity for building envelope improvements

Proposed Solution

Roof-Wall Joints

Existing – Buildings throughout the county were found to require roof-wall joint air sealing.

Proposed – Honeywell recommends using a high-performance sealant. In some buildings, two-component foam will be used. Any cantilevers off the buildings will be sealed with backer rod and sealant. Finally, the inside vestibule corners should be sealed with backer rod and sealant.

Roof Penetrations

Existing - There are many roof top exhaust fans that require damper cleaning, lubrication, and inspection for proper operation and to seal the roof deck to prevent penetration. Some units may be deemed to be too oversized for this service. Some buildings have roof-top AHUs (air handling units) with ducts that may show air leakage during an investment grade audit.

Proposed – Honeywell recommends if there is leakage, these duct penetrations will be sealed with two-component polyurethane foam. Skylights will also be sealed. Sealant will be injected behind the drip cap to eliminate airflow.

Roof Overhangs

Existing – We found that roof overhangs at exterior doors are open to the drop ceilings, providing a pathway allowing heated and cooled air to escape between the interior and exterior of the building.

Proposed – Honeywell proposes to install rigid foam boards and seal the perimeter and any penetrations with spray foam, in order to prevent air leakage and provide a sufficient thermal barrier between the spaces.

Windows

Existing - The operable windows in most of your buildings could present air leakage issues that require weather stripping with fuzz or gasket type materials.

Proposed – Honeywell recommends installing weather stripping and door sweeps to prevent air leakage.

Doors

Existing – Doors in this facility are in need of full weather stripping replacement and/or door sweeps.

Proposed – Honeywell recommends new weather stripping and door sweeps to be installed where needed.

Benefits

This work will allow for more efficient operation of your buildings by reducing heating and cooling losses throughout the year. In addition, the draftiness of the buildings and hot and cold spots will be significantly reduced. A reduction in air infiltration will also minimize potential concerns for dirt infiltration or indoor air quality concerns including allergies.

Energy Savings Methodology and Results

The energy savings for this ECM are realized at the buildings' HVAC equipment. The improved building envelope will limit conditioned air infiltration through openings in the building air barrier. Less infiltration means less heating required by the heating system.

Changes in Infrastructure

Building envelopes will be improved with little or no noticeable changes.

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced HVAC energy usage and better occupant comfort.
Waste Production	Some existing caulking and weather-stripping will be removed and disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 5A SOLAR POWER PURCHASE AGREEMENT (PPA)

The key benefits of this ECM include:

- **Reduced utility costs** due to lower electricity rates than grid-supplied power
- **Guaranteed utility rates for 15 years** to provide a valuable hedge against future price volatility and deliver greater budgetary certainty utilizing clean electricity
- **Additional savings** from solar can provide the school district with more potential ESIP funding to expand the overall project scope and include additional projects
- **Educational asset** to provide additional tools for teachers to engage students on sustainability and the environment
- **Low risk** given that maintenance is provided by the 3rd party system owner
- **No upfront costs**

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
5A Solar PPA	✓	✓	✓	✓	✓	✓	✓	

ECM Overview

Honeywell recommends that the school district further assess the feasibility of a solar photovoltaic system on district owned land and buildings to generate on-site renewable electricity. This could be provided at no upfront cost via a power purchase agreement (PPA). A PPA is a public-private partnership financial arrangement in which a third party solar company owns, operates, and maintains your photovoltaic system, while the host customer agrees to provide the site for the system on its property. The solar system's power production is purchased by you for a predetermined price ($/kWh) and for a predetermined period. This stable price for electricity will be lower than the utilities and third party supplier's, thereby allowing you to benefit from cheaper electricity prices, on-site renewable energy generation, a reduction in greenhouse gas emissions and a powerful educational tool for your teachers and students. Meanwhile, the system will not add any additional maintenance costs since it is owned by the third party solar company. One of the more significant benefits of this potential ECM is that it will provide for a rate change, helping to deliver greater savings within your ESIP project to help fund other measures.

Examples of ground-mounted and rooftop Solar PV arrays

Honeywell will oversee the design, construction and help with the operations and maintenance of the system. We will facilitate a feasibility study in conjunction with your technical consultant and legal team, to provide RFP development, solicitation and oversight of the installation of a solar photovoltaic system.

Proposed Solution

Honeywell proposes to install the solar PPA system at the buildings listed in the chart below.

Location	Rating kW-DC
Cedar Hill Elementary School	81
Hilldale Elementary School	103
Lazar Middle School	464
Montville High School	1,354
William Mason Elementary School	138
Valley View Elementary School	246
Woodmont Elementary School	166
TOTALS	2552

Table 5A.1– Proposed Solar Arrays

Energy Savings Methodology and Results

Savings are based on the difference in kWh price between the power purchasing agreement and the current electrical supplier.

Changes in Infrastructure

The proposed solar arrays would reside on rooftops and in open space at ground-level.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	None.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	Aside from the environmental benefits of increasing energy awareness no other environmental impact is expected.

ECM 6A COMBINED HEAT AND POWER

The key benefits of this ECM include:

- **Energy Savings** from utilizing a combined heat and power system to supplement the existing heating system
- **Operational savings** thanks to improved operational efficiencies unique to CHP technology
- **Resiliency** unique to CHP technology that can allow you to operate some systems during emergency situations and grid disruptions.

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
6A Cogeneration CHP				✓				

Existing Conditions

The High School is currently served by gas and electric utilities. The complex is a good candidate for Combined Heat and Power since the facility is used for events year-round.

Proposed Solution

Honeywell recommends the installation of one 10 kW combined heat and power generating unit that will generate electrical power and produce thermal energy that can supplement both heating and domestic hot water loads. This system will be appropriate for this site given the year-round operational needs of this facility, and leverage healthy state rebates to help pay for it. Since the unit is a synchronous generator its does not require any excitation energy to produce electricity and therefore may be used for emergency back-up power.

Tecogen Cogen Unit

Yanmar's 10kW CHP Module takes the many benefits of modular cogeneration. Modules come fully pre-packaged from the factory, including engine, generator, oil/ jacket/ exhaust heat recovery, controls, electrical switchgear, emissions controls, and modem for remote monitoring and data-logging. This allows for standardization and minimizes installation cost and complexity in the field. Also, comprehensive third-party certifications provide streamlined interconnection permitting with the local electric utility and are NJDEP Air Permit Exempt.

Scope of Work

Building	Qty	Make	Model
Montville HS	1	Yanmar	CP10WN

Table 6A.1 – Recommended Cogeneration Unit

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and customer will determine final selections. Yanmar CP10WN, Electrical Output 10 kW, Thermal Output 57,300 Btu/hr
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Energy Savings Methodology and Results

Savings are based on energy conversion of natural gas to thermal and electrical energy.

Changes in Infrastructure

The proposed CHP generator would reside inside the building.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. The customer and Honeywell will decide the exact location of the cogeneration installation at the site.

Environmental Issues

Resource Use	Electrical and thermal energy will be generated to supplement energy purchased from the electrical utility.
Waste Production	Any waste generated will be properly disposed of.
Environmental Regulations	Aside from the environmental benefits from on-site energy generation, no other environmental impact is expected.

ECM 7A PERMANENT LOAD REDUCTION PROGRAM

The key benefits of this ECM include:

- **Energy Savings** from reducing energy loads during peak hours
- **Equipment longevity** due to more efficient and less wasteful equipment utilization
- **Revenue generation** from participation in the permanent load reduction program

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
7A Permanent Load Reduction	✓	✓	✓	✓	✓	✓	✓	✓

Existing Conditions

The School District does not currently participate in the PJM Permanent Load Reduction Program, which compensates end-use (retail) customers for permanently reducing their electricity use (load) during periods of high power prices.

Proposed Solution

Permanent Load Reduction

PJM offers incentives to customers who install energy-efficient equipment that permanently reduces the use of electricity during peak times. Documentation of the type of new energy-efficient equipment installed, when it was installed, and how it is being used is required. PJM also requires a measurement of electricity usage during the peak summer periods to verify whether a building is using less energy. Also, as a cooperative, PJM relies on its members to combine projects together to make sure the volume is significant enough to impact their system.

Energy Savings Methodology and Results

Revenue is generated through participation in the PJM permanent load reduction program.

Changes in Infrastructure

None.

Customer Support and Coordination with Utilities

Honeywell will help facilitate the coordination with PJM.

Environmental Issues

Resource Use	None.
Waste Production	This measure will produce no waste by-products.
Environmental Regulations	None.

ECM 8A COMPUTER POWER MANAGEMENT

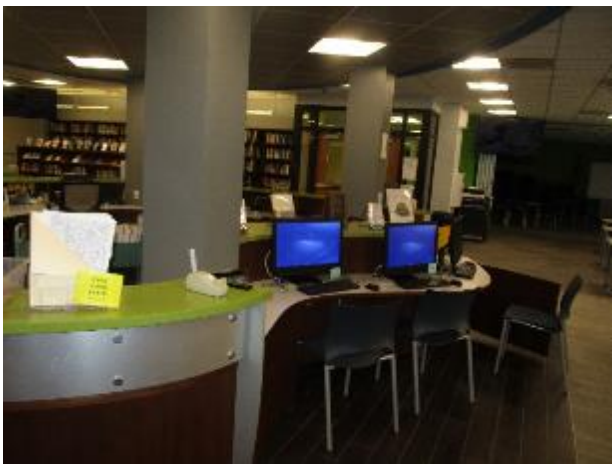
The key benefits of this ECM include:

- **Energy savings** by better managing the power consumption of computer equipment
- **Longer equipment life** thanks to reduced usage
- **Security protection** because external access can't occur when the computer system is shut down after hours
- **Virus protection** from the ability to shut down the computers before viruses reach the network

ECM Description	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
8A Computer Power Management	✓	✓	✓	✓	✓	✓	✓	✓

Existing Conditions

Information Technology (IT) is a major consumer of energy in school buildings and campuses. At more than 25 percent of total energy consumption energy efficient IT becomes less of a nice-to-have and more of a necessity. This ECM implements a power management system for all of your LAN based computers, printers and copiers throughout your buildings. The software system will automatically shut down your IT equipment at scheduled times to prevent unnecessary energy consumption during unoccupied hours.



High School Computer Lap

Media Center Computers

Proposed Solution

Honeywell proposes computer power management software *Surveyor* by Verdiem to manage PC consumption from phantom power, providing a detailed breakdown of usage by IT device type so as to allow energy managers to better plan, manage and optimize an organization's overall power consumption. This ECM will also provide for enhanced staff productivity. Energy consumption of distributed IT devices can be reduced by up to 60%. Verdiem helps IT departments to accurately measure IT device energy consumption, enforce policies for greater energy efficiency, and optimize savings.

Building	No. of Computers
Cedar Hill Elementary School	95
Hilldale Elementary School	76
Lazar Middle School	193
Montville High School	300
Valley View Elementary School	101

Building	No. of Computers
William Mason Elementary School	81
Woodmont Elementary School	93
Administration Building	41
Totals	980

Energy Savings Methodology and Results

Annual savings for administrative and student computers are based on previous logging results for computers with similar usage types.

Changes in Infrastructure

Power Management server will be integrated into current IT network.

Customer Support and Coordination with Software

Support will be required for software deployment by IT department.

Environmental Issues

Resource Use	Annual savings for administrative and student computers are based on previous logging results for computers with similar usage types.
Waste Production	None.
Environmental Regulations	No environmental impact is expected.

SECTION D TECHNICAL AND FINANCIAL SUMMARY

1. Recommended ESIP Project

	Recommended ESIP Project
Value of Project	$2,764,506
Term of Repayment	15 years
Projected Savings Over Term	$3,412,073
Projected NJ Rebates & Incentives	$134,982
Projected Positive Cash Flow	$208,201
Projected Interest Rate	3.75%

Recommended Project Technical and Financial Summary Documents

Form II: Energy Conservation Measures (ECMs) Summary Form
Form III: Projected Annual Energy Savings Data Form
Form IV: Projected Annual Energy Savings Data Form in MMBTUs
Form V: ESCOs Proposed Final Project Cost Form
Form VI: ESCOs Preliminary Annual Cash Flow Analysis Form

Building by Building Simple Payback Summary

A simple payback summary broken down by building by ECM has been provided for the Montville BOE's use in reviewing available scope combinations and options.

Building By Building Simple Payback Summary (Hard Costs Only)

FORM II: RECOMMENDED PROJECT - ENERGY CONSERVATION MEASURES (ECMs) SUMMARY FORM

FORM II
ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ENERGY CONSERVATION MEASUREs (ECMs) SUMMARY FORM
MONTVILLE TOWNSHIP PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: Honeywell International

Proposed Preliminary Energy Savings Plan: ECMs (Base Project)	Estimated Installed Hard Costs [1] $	Estimated Annual Savings $	Estimated Simple Payback (years)
1A LED Lighting	$ 1,310,205	$ 152,482	8.59
1B Lighting Controls/BMS Integration	$ 93,600	$ 1,508	62.05
1D Vending Misers	$ 7,800	$ 1,327	5.88
2C RTU Replacements	$ 357,997	$ 989	361.96
4A Building Envelope Improvements	$ 304,545	$ 44,381	6.86
5A Solar PPA	$ 0	$ 51,776	0.00
7A Permanent Load Reduction	$ -	$ -	-
9A Design Allowance	$ 97,500	$ -	-
0	$ -	$ -	-
0	$ -	$ -	-
Add additional lines as needed* **Project Summary:**	$ 2,171,646	$ 252,463	8.60

Optional ECMs Considered, but not included with base project at this time	Estimated Installed Hard Costs [1] $	Estimated Annual Savings $	Estimated Simple Payback (years)
1C Destratification Fans	$ 143,000	$ 6,931	20.63
1E Plug Load Management	$ 174,720	$ 7,437	23.49
2A 500 & 600 Wing Airedale Replacements	$ 830,651	$ 10,410	79.79
2B 500 & 600 Wing VRV Install/Airedale Refurbishment	$ 1,051,310	$ 10,000	105.13
2D Motor and VFD Replacements	$ 305,149	$ 10,436	29.24
2E Split System Replacements	$ 193,504	$ 315	614.02
2F DHW Replacement	$ 163,127	$ 619	263.50
2G Pipe Insulation	$ 814	$ 65	12.43
2H Kitchen Hood Controls	$ 91,000	$ 3,614	25.18
2I Walk In Compressor Controls	$ 6,500	$ 600	10.83
3A Transformers	$ 561,896	$ 16,294	34.48
6A Cogeneration CHP	$ 139,741	$ 1,300	107.49
8A Computer Power Management	$ 25,480	$ 8,978	2.84
0	$ -	$ -	-

Add additional lines as needed*

(1) The total value of Hard Costs is defined in accordance with standard AIA definitions that include: Labor Costs, Subcontractor Costs, Cost of Materials & Equipment, Temporary Facilities and Related Items, and Miscellaneous Costs such as Permits, Bonds Taxes, Insurance, Mark-ups, Overhead, Profit, etc.

FORM III: RECOMMENDED PROJECT - PROJECTED ANNUAL ENERGY SAVINGS DATA FORM

FORM III

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP)
PROJECTED ANNUAL ENERGY SAVINGS DATA FORM
MONTVILLE TOWNSHIP PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

The projected annual savings for each fuel type MUST be completed using the following format. Data should be given in the form of fuel units that appear in the utility bills.

Energy/Water	ESCO Developed Baseline (Units)	ESCO Developed Baseline (Costs $)	Proposed Annual Savings (Units)	Proposed Annual Savings (Costs $)
Electric Demand (KW)	16,176	$105,550	4,508	$29,507
Electric Energy (KWH)	4,798,833	$553,090	1,322,308	$124,254
Natural Gas (therms)	254,520	$256,911	10,945	$36,910
Fuel Oil (Gal)	0	$0	0	$0
Steam (Pounds)				
Water (gallons)				
Other (Specify Units)				
Other (Specify Units)				
Avoided Emissions (1)	Provide in Pounds (Lbs)			
NOX	1,357			
SO2	2,922			
CO2	1,659,511			

(1) ESCOs are to use the rates provided as part of this RFP to calculate Avoided Emissions. Calculation for all project energy savings and greenhouse gas reductions will be conducted in accordance with adopted NJBPU protocols

(2) "ESCOs Developed Baseline": Board's current annual usages and costs as determined by the proposing ESCO; based off Board's utility information as provided to proposing ESCO.

(3) "Proposed Annual Savings": ESCOs proposed annual savings resulting from the Board's implementation of the proposed ESP, as based upon "ESCOs Developed Baseline".

FORM IV: RECOMMENDED PROJECT - PROJECTED ANNUAL ENERGY SAVINGS DATA FORM IN MMBTUS

FORM IV

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
PROJECTED ANNUAL ENERGY SAVINGS DATA FORM IN MMBTUs
MONTVILLE TOWNSHIP PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

The projected annual energy savings for each fuel type MUST be completed using the following format. Data should be given in equivalent MMBTUs.

ENERGY	ESCO Developed Baseline	ESCO Proposed Savings Annual	Comments
Electric Energy (MMBTUs)	16,374	4,512	
Natural Gas (MMBTUs)	25,452	1,095	
Fuel Oil (MMBTUs)	0	0	
Steam (MMBTUs)			
Other (Specify) (MMBTUs)			
Other (Specify)			

NOTE: MMBTU Defined: A standard unit of measurement used to denote both the amount of heat energy in fuels and the ability of appliances and air conditioning systems to produce heating or cooling.

FORM V: RECOMMENDED PROJECT ESCO'S PROPOSAL PROJECT COST FORM

FORM V

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCOs PROPOSED FINAL PROJECT COST FORM FOR BASE CASE PROJECT
MONTVILLE TOWNSHIP PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **HONEYWELL INTERNATIONAL**

PROPOSED CONSTRUCTION FEES

Fee Category	Fees [1] Dollar ($) Value	Percentage of Hard Costs
Estimated Value of Hard Costs [2]:	$2,171,646	
Project Service Fees		
Investment Grade Energy Audit	$34,746	1.60%
Design Engineering Fees	$0	0.00%
Construction Management & Project Administration	$97,724	4.50%
System Commissioning	$10,858	0.50%
Equipment Initial Training Fees	$4,343	0.20%
ESCO Overhead	$195,448	9.00%
ESCO Profit	$86,866	4.00%
Project Service Fees Sub Total	$147,672	6.80%
TOTAL FINANCED PROJECT COSTS:	$2,601,632	19.80%
ESCO Termination Fee (To be paid only if the Board decides not to proceed beyond the ESP)	$0	0.00%

PROPOSED ANNUAL SERVICE FEES

First Year Annual Service Fees	Fees [1] Dollar ($) Value	Percentage of Hard Costs
SAVINGS GUARANTEE (OPTION)	$0	0.00%
Measurement and Verification (Associated w/ Savings Guarantee Option)	$20,000	Flat Fee
ENERGY STAR™ Services (optional)	Included	0.00%
Post Construction Services (If applicable)	N/A	-
Performance Monitoring	Included	-
On-going Training Services	N/A	-
Verification Reports	Included	-
TOTAL FIRST YEAR ANNUAL SERVICES	$20,000.00	Flat Fee

NOTES:
(1) Fees should include all mark-ups, overhead, and profit. Figures stated as a range will NOT be accepted.
(2) The total value of Hard Costs is defined in accordance with standard AIA definitions that include:

Labor Costs, Subcontractor Costs, Cost of Materials and Equipment, Temporary Facilities and Related Items, and Miscellaneous Costs such as Permits, Bonds Taxes, Insurance, Mark-ups, Overhead and Profit, etc.

ESCO's proposed interest rate at the time of submission: 5% TO BE USED BY ALLRESPONDING ESCOs FOR PROPOSAL PURPOSES

*Annual Service only applies if customer accepts energy guarantee.

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FORM VI: RECOMMENDED PROJECT ESCO'S PRELIMINARY ANNUAL CASH FLOW ANALYSIS FORM

FORM VI
ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCO's PRELIMINARY ANNUAL CASH FLOW ANALYSIS FORM
Montville Township Public Schools
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

Note: Proposers must use the following assumptions in all financial calculations:
(a) The cost of all types of energy should be assumed to inflate at: **2.4%** gas, **2.2%** electric per year and
(b) If it is necessary to inflate any other costs, these costs should also be assumed to inflate at: **2.4%** per year (this general inflation factor should NOT include increases in energy costs reflected above in (a), and should be noted if used in any calculation).

1. Term of Agreement: **15** (Years) (Months)
2. Construction Period (2) (months): **12**
3. Cash Flow Analysis Format:

Design Engineering Fee $ 162,873 7.5%
Project Cost From Form V: $ 2,601,632
Project Cost (1): **$ 2,764,506** Interest Rate to Be Used for Proposal Purpc **3.75%**

Year	Annual Energy Savings	Annual Operational Savings	Energy Rebates/Incentives	Total Annual Savings	Annual Project Costs	Board Costs	Annual Service Costs (3)	Net Cash-Flow to Client	Cumulative Cash Flow
Installation	$ 57,201		$ -	$ 57,201	$ -	$ -	$ -	$ 57,201	$ 57,201
1	$ 190,670	$ 61,793	$ 100,045	$ 352,508	$ (342,508)	$ (362,508)	$ (20,000)	$ 10,000	$ 67,201
2	$ 194,939	$ 63,276	$ 11,645	$ 269,860	$ (259,860)	$ (259,860)	$ -	$ 10,000	$ 77,201
3	$ 199,303	$ 64,794	$ 11,645	$ 275,743	$ (265,743)	$ (265,743)	$ -	$ 10,000	$ 87,201
4	$ 203,765	$ 66,349	$ 11,645	$ 281,760	$ (271,760)	$ (271,760)	$ -	$ 10,000	$ 97,201
5	$ 208,327	$ 67,942	$ -	$ 276,269	$ (266,269)	$ (266,269)	$ -	$ 10,000	$ 107,201
6	$ 212,992		$ -	$ 212,992	$ (202,992)	$ (202,992)	$ -	$ 10,000	$ 117,201
7	$ 217,761		$ -	$ 217,761	$ (207,761)	$ (207,761)	$ -	$ 10,000	$ 127,201
8	$ 222,637		$ -	$ 222,637	$ (212,637)	$ (212,637)	$ -	$ 10,000	$ 137,201
9	$ 227,622		$ -	$ 227,622	$ (217,622)	$ (217,622)	$ -	$ 10,000	$ 147,201
10	$ 232,719		$ -	$ 232,719	$ (222,719)	$ (222,719)	$ -	$ 10,000	$ 157,201
11	$ 237,930		$ -	$ 237,930	$ (227,930)	$ (227,930)	$ -	$ 10,000	$ 167,201
12	$ 243,258		$ -	$ 243,258	$ (233,258)	$ (233,258)	$ -	$ 10,000	$ 177,201
13	$ 248,705		$ -	$ 248,705	$ (238,705)	$ (238,705)	$ -	$ 10,000	$ 187,201
14	$ 254,275		$ -	$ 254,275	$ (244,275)	$ (244,275)	$ -	$ 10,000	$ 197,201
15	$ 259,969		$ -	$ 259,969	$ (248,970)	$ (248,970)	$ -	$ 10,999	$ 208,201
Totals	$ 3,412,073	$ 324,153	$ 134,982	$ 3,871,208	$ (3,663,007)	$ (3,683,007)	$ (20,000)	$ 208,201	$ 208,201

NOTES:
(1) Includes: Hard costs and project service fees defined in ESCO's PROPOSED "FORM V"
(2) No payments are made by Montville Township Public Schools during the construction period.
(3) This figure should equal the value indicated on the ESCO's PROPOSED "FORM V". DO NOT include in the Financed Project Costs.

Potential P4P Rebates from HS and MS $ 187,920

Total Cash Flow $ 396,121

***Annual Service only applies if customer accepts energy guarantee.**

HONEYWELL IS NOT ACTING AS A MUNICIPAL ADVISOR OR FIDUCIARY ON YOUR BEHALF. ANY MUNICIPAL SECURITIES OR FINANCIAL PRODUCTS INFORMATION PROVIDED IS FOR GENERAL INFORMATIONAL AND EDUCATIONAL PURPOSES ONLY AND YOU SHOULD OBTAIN THE ADVICE OF A LICENSED AND QUALIFIED FINANCIAL ADVISOR REGARDING SUCH INFORMATION.

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BUILDING BY BUILDING SIMPLE PAYBACK SUMMARY (HARD COSTS ONLY)

Building & ECM	kWh Savings ($)	kW Savings ($)	Natural Gas Savings ($)	Fuel Oil Savings ($)	Water Savings ($)	Annual Energy Cost Savings ($)	Annual Operational Savings ($)	Net Cost ($)	Simple Payback
Administration Building	**$ 1,151**	**$ 317**	**$ 25,988**	**$ -**	**$ -**	**$ 28,417**	**$ 960**	**$ 28,646**	**1.0**
1A LED Lighting	$ 840	$ 317	$ -	$ -	$ -	$ 2,118	$ 960	$ 24,326	7.9
1B Lighting Controls/BMS Integration	$ 193	$ -	$ -	$ -	$ -	$ 193	$ -	$ 2,600	13.5
1D Vending Misers	$ 98	$ -	$ -	$ -	$ -	$ 98	$ -	$ 390	4.0
4A Building Envelope Improvements	$ 20	$ -	$ 25,988	$ -	$ -	$ 26,008	$ -	$ 1,330	0.1
Cedar Hill Elementary School	**$ 11,110**	**$ 1,814**	**$ 1,412**	**$ -**	**$ -**	**$ 18,885**	**$ 4,549**	**$ 135,714**	**5.8**
1A LED Lighting	$ 4,172	$ 1,814	$ (235)	$ -	$ -	$ 10,300	$ 4,549	$ 95,590	6.4
1B Lighting Controls/BMS Integration	$ 882	$ -	$ (54)	$ -	$ -	$ 828	$ -	$ 5,200	6.3
1D Vending Misers	$ 122	$ -	$ -	$ -	$ -	$ 122	$ -	$ 780	6.4
4A Building Envelope Improvements	$ 442	$ -	$ 1,700	$ -	$ -	$ 2,142	$ -	$ 34,145	15.9
5A Solar PPA	$ 5,492	$ -	$ -	$ -	$ -	$ 5,492	$ -	$ 0	0.0
Hilldale Elementary School	**$ 11,075**	**$ 4,577**	**$ (213)**	**$ -**	**$ -**	**$ 20,136**	**$ 4,696**	**$ 132,013**	**5.3**
1A LED Lighting	$ 8,847	$ 4,577	$ (531)	$ -	$ -	$ 17,588	$ 4,696	$ 117,541	5.3
1B Lighting Controls/BMS Integration	$ 2,034	$ -	$ (122)	$ -	$ -	$ 1,911	$ -	$ 7,800	4.1
1D Vending Misers	$ 93	$ -	$ -	$ -	$ -	$ 93	$ -	$ 390	4.2
4A Building Envelope Improvements	$ 103	$ -	$ 441	$ -	$ -	$ 544	$ -	$ 6,282	11.6
Lazar Middle School	**$ 41,114**	**$ 5,870**	**$ 2,298**	**$ -**	**$ -**	**$ 62,885**	**$ 13,604**	**$ 355,799**	**4.7**
1A LED Lighting	$ 12,554	$ 5,870	$ (817)	$ -	$ -	$ 31,210	$ 13,604	$ 273,966	6.1
1B Lighting Controls/BMS Integration	$ 2,886	$ -	$ (188)	$ -	$ -	$ 2,698	$ -	$ 15,600	5.8
1D Vending Misers	$ 67	$ -	$ -	$ -	$ -	$ 67	$ -	$ 1,950	29.2
4A Building Envelope Improvements	$ 742	$ -	$ 3,303	$ -	$ -	$ 4,045	$ -	$ 64,282	15.9
5A Solar PPA	$ 24,866	$ -	$ -	$ -	$ -	$ 24,866	$ -	$ 0	0.0
Montville High School	**$ 30,048**	**$ 11,307**	**$ 3,097**	**$ -**	**$ -**	**$ 67,229**	**$ 22,776**	**$ 626,481**	**7.0**
1A LED Lighting	$ 23,017	$ 11,307	$ (1,551)	$ -	$ -	$ 55,549	$ 22,776	$ 473,168	6.0
1B Lighting Controls/BMS Integration	$ 5,291	$ -	$ (356)	$ -	$ -	$ 4,935	$ -	$ 33,800	6.8
1D Vending Misers	$ 654	$ -	$ -	$ -	$ -	$ 654	$ -	$ 3,120	4.8
4A Building Envelope Improvements	$ 1,086	$ -	$ 5,004	$ -	$ -	$ 6,091	$ -	$ 116,393	19.1
Valley View Elementary School	**$ 22,407**	**$ 2,921**	**$ 1,379**	**$ -**	**$ -**	**$ 34,336**	**$ 7,629**	**$ 567,944**	**13.5**
1A LED Lighting	$ 5,837	$ 2,921	$ (364)	$ -	$ -	$ 16,023	$ 7,629	$ 167,704	7.1
1B Lighting Controls/BMS Integration	$ 1,342	$ -	$ (84)	$ -	$ -	$ 1,258	$ -	$ 15,600	12.4
1D Vending Misers	$ 93	$ -	$ -	$ -	$ -	$ 93	$ -	$ 390	4.2
2C RTU Replacements	$ 1,727	$ -	$ -	$ -	$ -	$ 1,727	$ -	$ 357,997	207.3
4A Building Envelope Improvements	$ 285	$ -	$ 1,827	$ -	$ -	$ 2,112	$ -	$ 26,254	12.4
5A Solar PPA	$ 13,123	$ -	$ -	$ -	$ -	$ 13,123	$ -	$ 0	0.0
William Mason Elementary School	**$ 12,008**	**$ 1,225**	**$ 834**	**$ -**	**$ -**	**$ 17,671**	**$ 3,603**	**$ 103,440**	**4.9**
1A LED Lighting	$ 2,928	$ 1,225	$ (171)	$ -	$ -	$ 7,585	$ 3,603	$ 75,981	6.8
1B Lighting Controls/BMS Integration	$ 673	$ -	$ (39)	$ -	$ -	$ 634	$ -	$ 5,200	8.2
1D Vending Misers	$ 100	$ -	$ -	$ -	$ -	$ 100	$ -	$ 390	3.9
4A Building Envelope Improvements	$ 261	$ -	$ 1,045	$ -	$ -	$ 1,306	$ -	$ 21,869	16.7
5A Solar PPA	$ 8,047	$ -	$ -	$ -	$ -	$ 8,047	$ -	$ -	-
Woodmont Elementary School	**$ 4,269**	**$ 1,475**	**$ 1,493**	**$ -**	**$ -**	**$ 11,211**	**$ 3,974**	**$ 124,109**	**8.2**
1A LED Lighting	$ 3,055	$ 1,475	$ (187)	$ -	$ -	$ 8,318	$ 3,974	$ 81,928	6.7
1B Lighting Controls/BMS Integration	$ 702	$ -	$ (43)	$ -	$ -	$ 659	$ -	$ 7,800	11.8
1D Vending Misers	$ 100	$ -	$ -	$ -	$ -	$ 100	$ -	$ 390	3.9
4A Building Envelope Improvements	$ 412	$ -	$ 1,722	$ -	$ -	$ 2,134	$ -	$ 33,991	15.9
Project Total	$ 133,182	$ 29,507	$ 36,287	$ -	$ -	$ 260,769	$ 61,793	$ 2,074,146	6.4

2. Utility and Other Rebates and Incentives

NJ Pay-for-Performance Program (P4P)

Honeywell has been certified as a Pay for Performance Program Partner to provide technical services under direct contract to you. Acting as your energy expert, Honeywell will develop an Energy Reduction Plan for each project with a whole-building technical component of a traditional energy audit, a financial plan for funding the energy efficient measures and a construction schedule for installation. This supports your ability to take a comprehensive, whole-building approach to saving energy in your existing facilities and earn incentives that are directly linked to your savings.

Eligibility

Existing commercial, industrial and institutional buildings with a peak demand over 200 kW for any of the preceding twelve months are eligible to participate including hotels and casinos, large office buildings, multi-family buildings, supermarkets, manufacturing facilities, schools, shopping malls and restaurants. Buildings that fall into the following five customer classes are not required to meet the 200kW demand to participate in the Program: hospitals, public districts and universities, nonprofits, affordable multifamily housing, and local governmental entities. Your Energy Reduction Plan must define a comprehensive package of measures capable of reducing the existing energy consumption of your building by 15% or more to utilize the Pay Performance Program.

ENERGY STAR Portfolio Manager

Pay for Performance takes advantage of the ENERGY STAR Program with Portfolio Manager, EPA's interactive tool that allows facility managers to track and evaluate energy and water consumption across all their buildings. The tool provides the opportunity to load in the characteristics and energy usage of your buildings and determine an energy performance benchmark score. You can then assess energy management goals over time, identify strategic opportunities for savings, and receive EPA recognition for superior energy performance.

Incentives

Incentives for the P4P program are based on the annual electric and natural gas savings produced by the Energy Conservation Measures. There are three incentives to the program; details are included in the follow page. The first incentive is distributed after a finalized project is selected and bid. This usually occurs shortly before construction starts or shortly thereafter. The second incentive is distributed a few months after construction is completed, while the third incentive is distributed usually thirteen to fourteen months after the second incentive - once a year of building usage, post-retrofit, is completed.

Incentives, Rebates and Grants Summary

Honeywell has a great deal of experience in applying for, and successfully securing, all available incentives, rebates and grants for our clients. We have been approved and allocated for over $9M of incentives on behalf of our New Jersey customers alone since the introduction of the Energy Savings Improvement Program legislation in 2009. The New Jersey programs employed included primarily the Office of Clean Energy's Pay for Performance and Cogeneration Incentives.

Honeywell has determined that the Montville BOE is eligible for $134,982 in estimated total incentives for the projects. This includes $88,400 for Prescriptive Lighting program, and $46,582 for Permanent Load Reduction Incentives. There is a potential for an additional $187,920 in P4P Rebates if BMS Controls being installed by the District are included in this project

Please refer to the tables on below for a breakdown of Montville BOE incentive levels on a building by building basis for each type of incentive.

P4P Incentives

Building	P4P Incentives			
	First Incentive	Second Incentive	Third Incentive	Total Incentive
Cedar Hill Elementary School	$0	$0	$0	$0
Hilldale Elementary School	$0	$0	$0	$0
Lazar Middle School	$0	$0	$0	$0
Montville High School	$0	$0	$0	$0
Valley View Elementary School	$0	$0	$0	$0
William Mason Elementary School	$0	$0	$0	$0
Woodmont Elementary School	$0	$0	$0	$0
Administration Building	$0	$0	$0	$0
TOTALS	$0	$0	$0	$0

Permanent Load Reduction Incentives

Description	Permanent Load Reduction Incentives			
	1st Year Incentive	2nd Year Incentive	3rd Year Incentive	4th Year Incentive
Permanent Load Reduction Incentives	$11,645	$11,645	$11,645	$11,645

Direct Install Incentives

Description	Prescriptive Lighting Incentives			
	1st Year Incentive	2nd Year Incentive	3rd Year Incentive	4th Year Incentive
Cedar Hill Elementary School	$7,000			
Hilldale Elementary School	$6,500			
Lazar Middle School	$20,000			
Montville High School	$32,000			
Valley View Elementary School	$12,000			
William Mason Elementary School	$4,500			
Woodmont Elementary School	$5,000			
Administration Building	$1,400			
TOTALS	$88,400			

Total Rebates and Incentives

Year	Total Rebates and Incentives				
	P4P Incentives	CHP Incentives	Permanent Load Reduction Incentives	Prescriptive Lighting Incentives	Total Incentives
Installation				$88,400	$88,400
Year 1			$11,645		$11,645
Year 2			$11,645		$11,645
Year 3			$11,645		$11,645
Year 4			$11,645		$11,645
TOTALS			$46,582	$88,400	$134,982

3. Financing the ESIP

In accordance with P.L.2012, c.55 an ESIP can be financed through energy savings obligations. The term refers to the two primary financing tools, debt and lease-purchase instruments. Each of these options is discussed below.

Energy savings obligations shall not be used to finance maintenance, guarantees, or the required third party verification of energy conservation measures guarantees. Energy saving obligations, however, may include the costs of an energy audit and the cost of verification of energy savings as part of adopting an energy savings plan or upon commissioning. While the audit and verification costs may be financed, they are not to be considered in the energy savings plan as a cost to be offset with savings.

In all cases, maturity schedules of lease-purchase agreements or energy savings obligations shall not exceed the estimated average useful life of the energy conservation measures.

An ESIP can also include installation of renewable energy facilities, such as solar panels. Under an energy savings plan, solar panels can be installed, and the reduced cost of energy reflected as savings.

The law also provides that the cost of energy saving obligations may be treated as an element of the local unit's utility budget, as it replaces energy costs.

Debt Issuance

The law specifically authorizes municipalities, school districts, cities, counties, and fire districts to issue refunding bonds as a general obligation, backed with full faith and credit of the local unit to finance the ESIP. Because an ESIP does not effectively authorize new costs or taxpayer obligations, the refunding bond is appropriate, as it does not affect debt limits, or in the case of a board of education, require voter approval. The routine procedures for refunding bonds found in the Local Bond Law and Public School Bond Law would be followed for issuance of debt, along with any required Bond Anticipation Notes as authorized pursuant to law.

Regarding bonds for public schools, the Department of Education (DOE) has concluded that debt financed ESIP projects are not covered by State aid for debt service or a "Section 15 EFFCA Grant" as there is no new local debt being authorized.

Tax-Exempt Lease Purchase Financing

The tax-exempt lease is a common form of financing for ESIP projects. Tax-exempt leasing is a tool that meets the basic objectives of debt, spreading the cost of financing over the life of an asset, while avoiding constitutional or statutory limitations on issuing public debt. If structured properly, by including non-appropriation language in the financing documents, the tax-exempt lease will not be considered debt for state law purposes but will be considered debt for federal income tax purposes. Thus, for federal purposes, the interest component of the lease payment is tax-exempt.

Under the New Jersey Energy Savings Improvement Program (ESIP), the Montville BOE may authorize a lease purchase agreement between the Montville BOE and a financier. Ownership of the equipment or improved facilities will pass to the Montville BOE when all the lease payments have been made. There are legal expenses and other minimal closing costs associated with this type of structure. The lease purchase agreement may not exceed 15 years (commencing upon completion of the construction work), or 20 years where a combined heat and power or cogeneration plant is included in the project. The primary benefits of a lease are lower rates and the acquisition of essential use property without creating debt.

Under a lease there is typically a single investor. The lease may have non-appropriation language that allows the Montville BOE to access low tax exempt rates. Some previous customers have chosen to remove the non-appropriation language which has resulted in lower competitive rates.

Repayment of the lease payments is tailored to meet the requirements of the Montville BOE. Payments are typically scheduled to commence after the construction is complete and acceptance of the project has been received by the Montville BOE. Typically, payment terms are structured so there is no up-front capital expense to the Montville BOE and payments are aligned within your cash flow and fiscal limits.

Certificates of Participation (COP's)

Certificates of Participation are another form of a lease purchase agreement with the differentiating factor being that there are multiple investors participating in the purchase of the lease. COP's require financial disclosure and are typically utilized on higher value projects where one investor doesn't have the capacity to hold a high value lease for a single customer.

Energy Savings Obligations

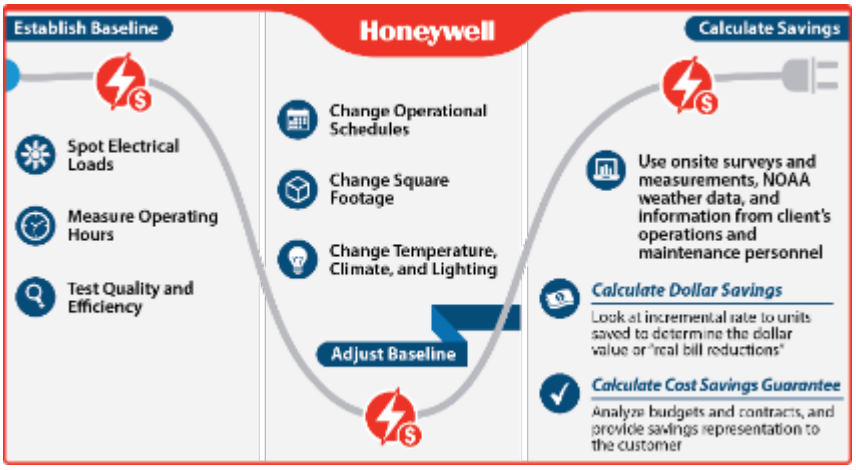
Energy Savings Obligations can be issued as refunding bonds in accordance with the requirements of N.J.S.A *40A:11-4.6(c)(3)*. These bonds may be funded through appropriation for the utility services in the annual budget of the contract unit and may be issued as refunding bonds pursuant to N.J.S.40A:2-52 et seq., including the issuance of bond anticipation notes as may be necessary, provided that all such bonds and notes mature within the periods authorized for such energy savings obligations. Energy savings obligations may be issued either through the contracting unit or another public agency authorized to undertake financing on behalf of the unit but does not require bond referendum.

SECTION E MEASUREMENT & VERIFICATION AND MAINTENANCE PLAN

1. Baseline

The purpose for establishing a baseline for an energy performance project is to accurately predict what the energy consumption and costs would have been as if the energy project was never completed. The baseline can then be used to measure the improvement in efficiency and determine the overall energy savings of the project. Since the energy consumption of all facilities is somewhat effected by variable weather conditions, a baseline for heating and cooling systems is typically dependent on degree-days or outside temperature. A baseline also needs to incorporate changes in facility use, such as a change in hours of operation or increased levels of outside air. Once again, if these changes would have occurred in the absence of the energy project, they should be incorporated into the project's baseline.

Honeywell will calculate the baseline based on the systems and operating conditions as they currently exist. Honeywell finds baseline development most accurate if specific measurements are taken on equipment over a period of time (early in the audit phase) to determine actual kW, kWh, oil and gas consumption, cfm, gpm, hours of use, etc. A summary of some of the methods, which will be used by Honeywell to establish baselines and support, calculated savings are listed below.



1. Spot measurements of electrical loads such as lighting, fan and pump motors, chillers, electric heat, etc.
2. Measurement of equipment operating hours using electric data recorders.
3. Measurement of existing operating conditions using data recorders for space temperature and humidity, air handler temperatures (mixed, return, cooling and heating coil discharges), and space occupancy using lighting loggers.
4. Spot measurement for boiler efficiencies, water use.
5. Running measurements of chiller operation, including simultaneous measurement of input kWh or steam flow, and chilled water supply and return temperatures and flow (gpm).
6. Records of operating conditions from building management systems and utility-grade meters.

The data from the above is used to calculate existing energy use, which is then reconciled with current facility utility bills, and adjusted as required to provide a mutually agreed baseline.

To provide valid savings evaluations, Honeywell's maintains a significant inventory of metering equipment utilized by its auditors and Energy Engineers to ascertain critical data about the operation of the facility.

Typically, Honeywell's auditors use the following equipment for their onsite measurements:

1. Recording and instantaneous power and harmonic analyzers.
2. Data loggers for pressures, temperatures, flow rates, humidity and CO_2.
3. Lighting level and recording profile/run-hour and occupancy meters.
4. Multimeters, hand held kW meters.
5. Combustion analyzers.
6. Ultrasonic flow meters.
7. Infrared thermometers

The ECMs installed in many projects allow for energy savings to be identified by direct metering or a combination of metering and calculations with accepted assumptions. In the case of lighting, for example, it is relatively easy to meter representative samples of unique fixture types, both before and after a retrofit, to determine the power consumption difference in Watts. When multiplied by the quantity of each fixture type, the total connected load reduction can be derived. In combination with run time assumptions,

or meters, the electrical reduction can be accurately determined. Where possible, direct measurement of ECMs during construction (before and after the retrofit) coupled with energy savings calculations is a method the Honeywell finds to be very accurate and cost-effective.

Due to the nature of some ECMs, or when a combination of ECMs is installed, individual (discrete) metering may not be either possible or able to fully document a baseline and calculate savings. Many of these situations can be handled by combining results from metering along with either engineering-based calculations or output from nationally recognized building simulation programs such as DOE II, ASEAM, TRACE or HAP. This method would be used for ECMs such as night setback, and where no other ECMs have significant interaction with the setback measure.

Formulas exercised in energy savings calculations follow the laws of physics, and many are included in the ASHRAE Handbook of Fundamentals. However, such calculations (i.e. equipment operation profiles) must be tempered by experience, past retrofit practice, and expectations of future operating conditions to arrive at achievable values in practice. Honeywell always reviews each and every project, in detail, for the anticipated savings and never hesitates to reduce the anticipated energy calculations where experience dictates necessary. The final result is a coupled project where the final savings are equal to or greater than anticipated.

Calculating the units of energy saved is a critical measure of energy efficiency improvements, but it does not indicate the actual dollars saved. To do this, Honeywell and the Montville BOE will establish the base rates that will act as "floor" rates in calculating the savings. These are usually the rates that are in effect at the time of the start of the contract or rates used for audit estimated savings.

2. Adjustment to Baseline Methodology[1]

Honeywell's methodology for establishing and adjusting the baseline is determined by the characteristics of the facility, the conservation technology being installed, the technology being replaced, the type of measurement and verification the Montville BOE requires and the needs of the Montville BOE for future changes in facility use.

The purpose of this flexible approach is to make the most accurate possible measurement of the changes in energy uses that are specifically attributable to Honeywell installed ECMs. This creates the ability over the life of the contract to continue measuring only savings achieved by Honeywell and leaves the Montville BOE free to make future changes to the building or systems without affecting the savings agreement. It also necessitates fewer provisions for making adjustments to the baseline.

Modifications to the energy baseline or savings will be made for any of the following:

1. Changes in the number of days in the annual review cycle.
2. Changes in the square footage of the facilities.
3. Changes in the operational schedules of the facilities.
4. Changes in facility indoor temperatures.
5. Significant changes in climate.
6. Significant changes in the amount of equipment or lighting utilized in the facility.

Examples of situations where the baseline needs to be adjusted are: i) changes in the amount of space being air conditioned, ii) changes in auxiliary systems (towers, pumps, etc.) and iii) changes in occupancy or schedule. If the baseline conditions for these factors are not well documented it becomes difficult, if not impossible, to properly adjust them when they change and require changes to payment calculations. To compensate for any addition and deletion of buildings and impact on the baseline model, Honeywell will use sound technical methodologies to adjust the baseline. An example would be to add or delete building energy impact via the calculated cooling load in tons as a percentage of the existing campus tonnage baseline or use indices like W/ft^2 and Btu/ft^2 to calculate the energy consumption of the building and then add or subtract the energy usage to or from the baseline energy consumption.

[1] The energy baseline modifications shall use commonly accepted energy engineering methods that are mutually agreeable to both Honeywell and customer. Should agreement on these methods, including the climate adjustments, not be reached between Honeywell and customer, both parties could appeal to an independent engineering.

3. Energy Savings Calculations

In calculating energy savings, Honeywell's highly experienced audit staff uses onsite surveys and measurements, National Oceanic and Atmospheric Administration weather data, detailed discussions with the client's operations and maintenance personnel and engineers, utility records, and other sources to ensure accurate energy, water and O&M savings.
Typically, the following data is gathered:

1. Local weather data.
2. Utility bills and sub-metered consumption trends.
3. Utility rate structure.
4. Facility use and occupancy data.
5. Internal equipment loads.
6. Interviews of operations and maintenance staff and management.
7. Building construction, age, use and layout.
8. Schematics of energy and water distribution systems.
9. Identification and inventory of HVAC equipment.
10. Identification and inventory of process equipment.
11. Design, configuration and operating characteristics of HVAC systems.
12. Design, configuration and operating characteristics of process systems.
13. Control strategies and sequences of operation for HVAC and other process equipment.
14. Identification and count of all lighting fixtures and determination of power consumption for each type.
15. Identification and inventory of lighting control methods.
16. Measurement of foot-candle levels at sample locations.
17. Power quality and harmonics, power factor.
18. Indoor air quality issues.

Calculating the units of energy saved is a critical measure of energy efficiency improvements, but it does not indicate the actual dollars saved. To do this, Honeywell and the Montville BOE will establish the base rates that will act as "floor" rates in calculating the savings. These are usually the rates that are in effect at the time of the start of the contract or rates used for audit estimated savings.

The equation below will be used to calculate the annual savings in dollars.

$$AnnualSavings(\$) = \sum_{m=1}^{12} \{(Rate_{kWh,Base} \times kWh_{Saved,m}) + (Rate_{fuel\ Oil,\ Base} \times Fuel\ Oil_{Saved,\ gal,\ m}) + (Rate_{Steam,\ Base} \times Steam_{Saved,\ klbs,\ m}) + (Rate_{NG} \times NG_{Saved,\ MCF,\ m})\} + Agreed(\$)$$

where:

$Rate_{kWh,Base}$= defined base rate for kWh consumption
$kWh_{Saved,m}$= calculated kWh savings for month *m*

$Rate_{Fuel\ Oil,\ Base}$= defined base rate for fuel Oil savings (XX/gal.)
$Fuel\ Oil_{Saved,m}$= calculated chilled water savings in gal. for month *m*

$Rate_{Steam,Base}$= defined base rate for steam consumption ($XX/MMBtu.)
$Steam_{Saved,m}$= calculated Steam savings in MMBtu. for month *m*

$Rate_{NG,Base}$= defined base rate for natural gas consumption ($XX/Therm)
$NG_{Saved,m}$= calculated natural gas savings in Therms for month *m*

Agreed($)= Annual savings in dollars (water, sewer, maintenance, etc.)

Honeywell assigns dollar values to the true incremental value of savings for energy and water. In other words, we do not combine for example, demand and consumptions numbers so that there is an average value to savings. Honeywell looks at each incremental rate to units saved to properly determine the value (dollar) to the Montville BOE or "real bill reductions". As noted in the RFP energy escalation rates will be established in accordance with New Jersey Board of Public Utility guidelines.

Based on this, Honeywell will review all utility bills (hourly data), tariffs, special contracts and commodity contracts to develop the incremental value (costs) of each utility.

The O&M savings is typically a function of existing the Montville BOE's budgets (labor & direct costs), maintenance contracts and operations (supplier) contracts. Honeywell will analyze the information to provide a conservative savings representation for the Montville BOE's review and acceptance. The information will include all calculations and assumptions.

4. Measurement & Verification

The purpose of performing any monitoring and verification is to establish an agreed upon process that provides the customer both a level of satisfaction that the improvements have been delivered and ongoing information as to their operation and performance. Additionally, this effort will be used to assess the actual dollars of savings versus the guarantee level.

It is essential for the success of this program that Honeywell and the Montville BOE agree on a mutually acceptable methodology for measuring and verifying energy savings that are attributable to the energy conservation measures (ECMs) Honeywell installs. This M&V plan provides the procedures to document the energy and cost savings of each of the proposed ECMs.

The plan for monitoring and verifying energy savings for the proposed ECMs is based on the methods described in the *International Performance Measurement and Verification Protocol (IPMVP)*[2]. Our approach to M&V is directly consistent with, and in compliance with, the IPMVP. This protocol provides a framework for the most widely accepted and used M&V methods by the industry.

Engineering calculations of energy and cost savings for the project are based on operating parameters (such as weather, temperature settings, run hours, occupancy patterns, and space usage) and equipment performance characteristics. The M&V plan uses the operating parameters established in the baseline for all savings calculations during the term of the project. The intent of the M&V plan is to verify that the ECMs installed by Honeywell will provide the expected energy savings. Therefore, Honeywell will collect data and relative information during the post-retrofit period to demonstrate that the installed equipment is performing at expected levels. It is assumed that the Montville BOE will continue to be a dynamic institution adding or renovating buildings and desiring to retain the right to set comfort and operating characteristics. To accommodate this, Honeywell will develop its M&V plan in a way that allows the Montville BOE to adapt to the demands of future campus growth and changes without the need for the Montville BOE and Honeywell to negotiate energy baseline adjustments.

Our typical M&V plan will utilize broadband Internet access to the appropriate the Montville BOE's control interfaces to both confirm operating status and to download trend data to verify proper equipment maintenance.

One year after the commencement date of the ECMs, Honeywell will submit a report verifying and calculating the energy and cost savings for the first year. This report will be submitted for facility review and approval. For the remaining contract term, Honeywell will provide annual reports. These reports will include results of inspections of the installed equipment/systems, energy and cost savings, and recommendations to provide optimum energy performance.

The following table lists the information concerning typical M&V equipment used:

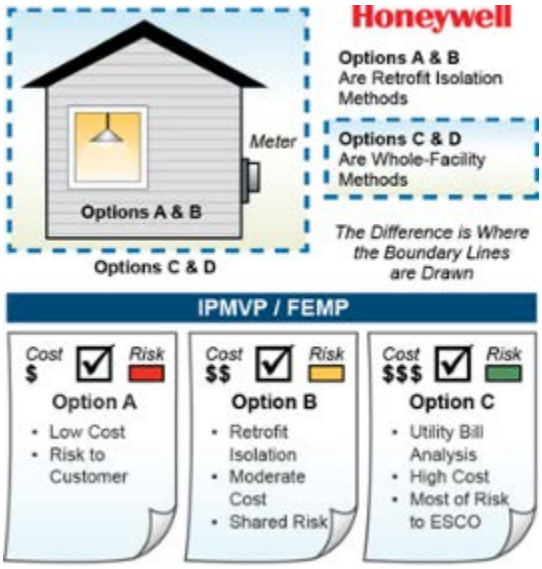
Instrument	Make
Power Multi-meter	Fluke 39
Light Meter	Osram or Phillips
Portable Temperature/Humidity Multi-meter	TSI
Retractable Insertion Vortex Flow meter	Hydro-Flow Model 3100
BTU Meter	Hydro-Flow BTU-121 BTU/Energy Measurement System
KW/KWH Transducers	Veris Industries (H6000 SERIES)

All permanent measurement equipment will be purchased new with a calibration certificate from the manufacturer. The power multi-meter and the TSI multi-meter will be calibrated annually before using them in the annual inspection.

[2] www.ipmvp.org.

General Approach to M&V

Energy and water savings are determined by comparing the energy and water use associated with a facility or certain systems within a facility before and after the installation of an ECM or other measure. The "before" case is the baseline. The "after" case is the post-installation or performance period. Baseline and post-installation energy use measurements or estimates can be constructed using the methods associated with M&V options A, B, C, and D, as described in the IPMVP. The challenge of M&V is to balance M&V costs, accuracy, and repeatability with the value of the ECM(s) or systems being evaluated, and to increase the potential for greater savings by careful monitoring and reporting.



M&V Options

The IPMVP guidelines classify the M&V procedures into four categories, Options A, B, C and D. As shown in the table below, these options differ in their approach to the level of complexity of the M&V procedures.

M&V Option	Performance Verification Techniques
Option A Verifying that the measure has the potential to perform and to generate savings.	Option A is appropriate for ECMs that have energy use that can be readily quantified, such as the use of high efficiency lighting fixtures, high efficiency constant speed motors, and other standard engineering calculations. Engineering calculations before and after installation spot measurements and use of EMS data points with stipulated values.
Option B Verifying that the measure has the potential to perform and verifying actual performance by end use.	Option B is appropriate for ECMs that require periodic or on-going measurements to quantify energy use; such as the use of variable frequency drives on pump or fan motors. Engineering calculations with metering and monitoring strategy throughout term of the contract.
Option C Verifying that the measure has the potential to perform and verifying actual performance (whole building analysis.)	Option C is used for ECMs for which the energy use or energy savings cannot be measured directly, such as building envelope modifications. Option C is based on the use of utility meters to quantify building energy use. Utility meter billing analysis-using techniques from simple comparison to multivariable regression analysis.
Option D Verifying actual performance and savings through simulation of facility components and/or the whole facility	Option D is used for ECMs for which the energy use or energy savings cannot be measured directly, or savings for individual ECMs are heavily interdependent. Calibrated building simulation is used to separate the energy savings attributable to each ECM. Calibrated energy simulation/modeling; calibrated with hourly or monthly utility billing data and/or end-use metering.

In general,

ECM Energy Savings = Baseline Energy Use - Post-Installation Energy Use

And
Energy Cost savings ($) = Total Energy Savings x Contractual Energy Rates

Exceptions to this simple equation are as follows:

Projects where an on/off M&V method is used. For example, after a new energy management system is installed, control features are turned off for a set period of time to recreate baseline conditions. Thus, savings are determined after installation by comparing energy use with and without the control features activated.

Since energy use at a facility is rarely, if ever, constant, another way to define M&V is as a comparison of a facility's post-installation energy use with its usage if the ECM or system had not been installed. This takes into account situations in which baseline energy use must be adjusted to account for changing conditions, such as changes in facility operation, occupancy, or use or external factors such as weather.

Post-Retrofit M&V Activities

There are two components associated with M&V of performance contract projects:

1. Verifying the potential of the ECM to generate savings also stated as confirming that the proper equipment/systems were installed, are performing to specification and have the potential to generate the predicted savings.
2. Determining/verify energy savings achieved by the installed ECM(s).

Verifying the Potential to Generate Savings

Verifying baseline and post-installation conditions involves inspections (or observations), spot measurements, and/or commissioning activities. Commissioning includes the following activities:

- Documentation of ECM or system design assumptions
- Documentation of the ECM or system design intent for use by contractors, agencies and operators
- Functional performance testing and documentation necessary for evaluating the ECM or system for acceptance
- Adjusting the ECM or system to meet actual needs within the capability of the system

Post-Installation Verification

Post-installation M&V verification will be conducted by both Honeywell and the Client to ensure that the proper equipment/systems that were installed are operating correctly and have the potential to generate the predicted savings. Verification methods may include surveys, inspections, and/or spot or short-term metering.

Regular Interval Post-Installation Verification

At least annually, Honeywell will verify that the installed equipment/systems have been properly maintained, continue to operate correctly, and continue to have the potential to generate the predicted savings. Savings report for all the installed ECMs will be submitted each year after the acceptance date of the work performed by Honeywell.

Computation of Energy Savings

After the ECMs are installed, energy and cost savings will be determined annually by Honeywell in accordance with an agreed-upon M&V approach, as defined in a project-specific M&V plan.

Construction/Interim Savings

Construction or Interim savings are usually measured by using the same methodology as described in the detail M&V plan for each ECM. The start and the completion time for each ECM must be agreed to between Honeywell and the Montville BOE.

Electricity and thermal savings from the ECMs where no detailed long-term data is required to be collected will be stipulated and will be based on the starting and the final completion dates and verification of the operation of the ECMs. For other ECMs where long-term data collection is required by the M&V plan, data will be used to calculate the savings using the same equations as described in the detail plan. For example, to calculate electricity savings for the installation of a VFD, the kW is spot measured at a set speed for selected motors through a sampling plan. The measured kW is subtracted from the baseline kW to calculating the savings. Thermal savings are tied to the electrical savings in the manner described in the detail M&V plan. The results are extrapolated to cover all the VFDs installed by Honeywell.

The savings for each of the monitored VFD is calculated on an interval basis as follows:

$kW_{Saved} = (kW_{Base} – kW_{Spot\ Measured})$
kWh_{Saved} = Estimated operating hours during the interim period * kW_{Saved}
The total kWh savings is the sum of the kWh_{Saved} for all the installed VFDs.

5. Site Specific M&V Plan

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
ECM 1A – LED Lighting	Upgrade Lighting systems: Re-lamp/Re-ballast T-8 to LED New Fixtures Incandescent to LED Metal Halide and Sodium Vapor to LED High Bays	Option A: Pre and Post measurements Line by Line scope and engineering calculations	Pre M&V: Measurement of KW for 5% sample fixtures in each category Data log usage hours Data Log occupancy schedules Update Line by Line scope with measured KW and usage hours Post M&V: Measurement of KW for 5% sample fixtures in each category Usage Hours to remain same Occupancy schedules to remain same Energy Savings: Update Line by Line scope with measured KW and usage hours and compare to pre-retrofit calculated savings
ECM 1B – Lighting Controls/	Integrate Outside Lighting Controls into BMS system throughout District	Option A: Pre and Post measurements Line by Line scope and engineering calculations	Pre M&V: Measurement of KW for 5% sample fixtures in each category Data log usage hours Data Log occupancy schedules Update Line by Line scope with measured KW and usage hours Post M&V: Measurement of KW for 5% sample fixtures in each category Usage Hours to remain same Occupancy schedules to remain same Energy Savings: Update Line by Line scope with measured KW and usage hours and compare to pre retrofit calculated savings
ECM 1C - De-Stratification Fans	Install De-Stratification fans in Gymnasiums, Cafeterias and Auditoriums to minimize stratification of hot air and maintain hot air flow below the fan level	Option A: Engineering calculations based on comparison of existing operations and post installation operation	Pre M&V: Verify parameters used in engineering calculations with equipment name plate data and savings assumptions Post M&V: Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 1D – Vending Misers	Install Vending machine energy management devices	Option A: Pre and Post measurements Line by Line scope and engineering calculations	Pre M&V: Measurement of KW for 5% sample machines in each category Data log usage hours Data Log occupancy schedules Update Line by Line scope with measured KW and usage hours Post M&V:

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
			Measurement of KW for 5% sample machines in each category Usage Hours to remain same Energy Savings scope with measured KW and usage hours and compare to pre-retrofit calculated savings
ECM 1E - Plug Load Management	Provide Wi-Fi enabled programmed electrical outlet strips to shut down computer peripherals and various plug loads when building is not occupied	Option A: Engineering calculations based on comparison of existing operations and post installation operation	Pre M&V: Verify parameters used in the calculations based on data provided by Data loggers on selected pieces of equipment Post M&V: Verify that the control equipment is installed and programmed as specified. Data log to verify reduced hours of operation
ECM 2A – 500 & 600 Wing Airedale Replacements	Replace Airedale Units in 500 & 600 Wing Classrooms	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement Units	Pre M&V: Verify manufacturer provided data for existing unit efficiency Post M&V: Verify manufacturer provided data for new condensing unit – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2B – 500 & 600 Wing VRV Replace Refurbishment	Replace Airedale Units in 500 & 600 Wing Classrooms	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement Units	Pre M&V: Verify manufacturer provided data for existing unit efficiency Post M&V: Verify manufacturer provided data for new condensing unit – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2C - Rooftop Unit Replacement	Replace antiquated Roof Top Units with new high efficiency VFD equipped Rooftop Units	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement units	Pre M&V: Verify manufacturer provided data for existing unit efficiency (IEER) Post M&V: Verify manufacturer provided data for new condensing unit (IEER) – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2D - Motors and VFD Replacements	Install Variable Frequency Drives on hot water pumps to operate the pump motors in response to the system load. Replace antiquated motors with new premium efficiency motors	Option A: Engineering calculations for variable frequency drives following pump affinity laws. Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement motors	Pre M&V: Verify manufacturer provided data for the pump performance data and motor efficiencies. Post M&V: Obtain trend data for VFD operation from the BMS system to verify baseline calculation assumptions on system loads Verify efficiency of new motors Verify manufacturer provided data for new chiller efficiency (kW/ton) – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2E– Split System Replacements	Replace Split systems at various building with new high efficiency units	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement Units	Pre M&V: Verify manufacturer provided data for existing unit efficiency (SEER) Post M&V: Verify manufacturer provided data for new Chiller unit (SEER) – verify the new equipment and controls are installed and commissioned as recommended by manufacturer

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
ECM 2F – Domestic Hot Water Replacements	Replace existing domestic hot water heater with condensing natural gas domestic hot water heater	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement Units	Pre M&V: Verify manufacturer provided data for existing unit efficiency Post M&V: Verify manufacturer provided data for new condensing unit – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2H - Kitchen Hood Controls	Install control devices on the Kitchen hoods to control exhaust air in response to the cooking load. Replace fan motors with new premium efficiency motors and VFD drives	Option A: Engineering calculations for variable frequency drives following affinity laws. Engineering calculations based on nameplate, manufacturer supplied data and operating hours for the existing and replacement motors	Pre M&V: Verify manufacturer provided data for the motor performance data and motor efficiencies. Post M&V: Obtain trend data for VFD operation from the BMS system to verify baseline calculation assumptions on system loads Verify efficiency of new motors
ECM 2I – Refrigeration Controllers	Install control device on walk-in freezer and refrigerator evaporators to shut down the fan motor when the compressor is off on duty cycle	Option A: Stipulated Engineering calculations based on case studies for the Intellidyne control	Pre M&V: None Post M&V: Savings stipulated based on engineering calculations for the term of contract
ECM 3A – Transformer Replacements	Replace existing secondary transformers with high efficiency equivalents	Option A: Engineering calculations based on increase in transformer efficiency	Pre M&V: Measure typical existing transformer (typical one for each size) input and output KW to establish transformer losses Post M&V: Measure input and output KW for new transformer (typical one for each size) Verify savings with engineering calculations
ECM 4A - Building Envelope Improvements	Install weather stripping on doors, seal roof wall joints and roof penetrations	Option A: Electric energy savings - Engineering calculations based on programmed parameters.	Pre M&V: Verify parameters and site conditions Post M&V: Verify parameters used in engineering calculations with site conditions
ECM 5A – Solar Power Purchase Agreement (PPA)	Install Solar PV Panels	Option: None	Pre M&V: None Post M&V: None
ECM 6A – Combined Heat & Power (CHP)	Install Cogeneration Unit	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the cogeneration	Pre M&V: Baseline annual fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform combustion efficiency test on boilers

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
		units and - engineering calculations based on programmed parameters. Option C: Utility Bill Comparison for all fuel related measures	Verify parameters used in engineering calculations with site conditions Post M&V: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform efficiency test on replaced boilers to insure operating conditions are maintained
ECM 7A – Permanent Load Reduction	Savings from KW demand reduction	N/A	Pre M&V: N/A Post M&V: N/A
ECM 8A – Computer Power Management	Install control software to ensure desktop computers revert to sleep mode when not being used.	Option A: Stipulated Engineering calculations based on computer power management Manf. Software information.	Pre M&V: None Post M&V: Savings stipulated based on engineering calculations for the term of contract

6. Guarantee of Savings

The approach that Honeywell utilizes in this asset management program includes two key components: a *performance guarantee* and *financial savings*. Honeywell guarantees the Montville BOE that all installations and work performed are subject to final inspection and the Montville BOE's acceptance. This procedure ensures all work will be to the level of quality the Montville BOE expects.

Honeywell also guarantees it will meet the objectives mutually defined with the Montville BOE. Honeywell takes its commitment to partner with the Montville BOE for the life of the contract seriously, and looks forward to a successful, long-term partnership.

Honeywell considers the guarantee to be the cornerstone of our service to you. To be considered a *performance contract* an energy guarantee is an optional component under the New Jersey Energy Savings Improvement Program (ESIP) legislation. The basis of an energy performance contract is that the majority of risk is shifted from the Montville BOE to the ESCO. The strength of the Guarantee is only as good as the Company backing it and their financial solvency. With over $40.5 Billion in assets, Honeywell has the financial strength and background to support the Montville BOE for the long term.

Savings Guarantee: With the understanding that the Montville BOE must maintain fiscal health and accountability, Honeywell can financially guarantee the results of its programs and clearly support this obligation with the commitment to regular review of program results and reconciliation. Honeywell's financial strength and stability give it the ability to extend a FIRST-PARTY GUARANTEE to the Montville BOE. A first party guarantee eliminates the risk on the Montville BOE and places it directly onto Honeywell. This differs from some other ESCO's who provide a third-party guarantee, which insulates them from the owner through the use of insurance instruments.

If at the end of any year the program has not met or exceeded the guaranteed savings for that year, Honeywell will refund the difference between the guaranteed amount and what was actually saved.

For all equipment covered by the Energy Savings Guarantee, the Montville BOE shall be responsible for on-going maintenance and component replacement in accordance with manufacturer's standards. The customer will also be responsible for operating the equipment in accordance with manufacturer's specifications.

Honeywell will develop savings methodologies that follow current industry practice, such as outlined by the New Jersey Board of Public Utilities (BPU) and Federal Energy Management Program's (FEMP) M&V Guidelines: Measurement and Verification for Federal Energy Projects. References to M&V protocols from the International Performance Measurement and Verification Protocol (IPMVP), ASHRAE Guideline 14 and the Air-Conditioning Refrigeration Institute (ARI) are used to further qualify the M&V plan.

As stated above, under the New Jersey ESIP legislation acceptance of a performance guarantee is optional at the Montville BOE sole discretion. In the same way, the duration of the guarantee is also optional. Many of Honeywell's New Jersey customers have elected to keep the guarantee in force for less than the total performance periods, i.e. three (3) to five (5) years. Others have elected to accept a one (1) year guarantee, while reserving the option to renew for additional years after they have had the opportunity to review the track record of actual savings results. Obviously, this a very customer specific decision based on the risk management culture of each unique organization. The key point is that Honeywell is flexible with regard to the structure and duration of the guarantee. The final terms will be discussed and defined as part of our co-authored ESIP project.

Solely for informational purposes, it is worth noting that if the Montville BOE does elect to accept a guarantee, New Jersey ESIP law requires that the Montville BOE contract with a third-party independent firm to verify that the energy savings are realized. To preserve the independent status of this contractor these costs are required to be incurred directly by the Montville BOE.

Honeywell develops and implements every project with the same high level of detail and confidence and therefore will always provide a Savings Guarantee at no additional cost. However, if the Montville BOE opts to accept the Savings Guarantee, the fee indicated on Form V in Section H-1 will be applicable to account for on-going Honeywell service costs incurred during the measurement and verification of the savings as indicated in Form V of our RFP response.

All guarantees require that the owner maintain the system in accordance with the manufacturer's specifications. Regardless of guarantee acceptance, ongoing maintenance as recommended by the BPU, Honeywell and / or manufacturer specifications is required to achieve the projected energy savings. Maintenance should also include a periodic verification of the system to make sure the maintenance is properly conducted and the system is meeting the original specifications and design.

7. Recommended Preventive Maintenance Services

Per the NJ ESIP program, all services are required to be bid by the Montville BOE for services as desired. Based on Honeywell's vast service organization, we are uniquely qualified to develop design specification for the public bidding per NJ Law.

Honeywell strongly believes that the long-term success of any conservation program is equally dependent upon the appropriate application of energy savings technologies, as well as solid fundamental maintenance and support. One of the primary contributors to energy waste and premature physical plant deterioration is the lack of operations, personnel training and equipment maintenance.

Honeywell recommends routine maintenance on the following systems throughout the Montville BOE for the duration of an energy guarantee of savings

Maintenance, Repair and Retrofit Services:

- Mechanical Systems
- Building Automation Systems
- Temperature Control Systems
- Air Filtration

Honeywell will work with the Montville BOE to evaluate current maintenance practices and procedures. This information will be the basis of a preventive maintenance and performance management plan designed to maximize building operating efficiencies, extend the useful life of your equipment and support the designed Energy Savings Plan.

At a minimum, we recommend the following tasks be performed on a quarterly basis with the Montville BOE Wide Building Management System.

System Support Services

1. Review recent mechanical system operation and issues with customer primary contact, on a monthly basis.
2. Review online automation system operation and event history logs and provide summary status to the customer primary contact. Identify systemic or commonly re-occurring events.
3. Check with customer primary contact and logbook to verify that all software programs are operating correctly.
4. Identify issues and prioritize maintenance requests as required.
5. Provide technical support services for trouble shooting and problem solving as required during scheduled visits.
6. Provide ongoing system review and operations training support; including two semi-annual lunches and learn sessions.
7. Establish dedicated, site-specific emergency stock of spare parts to ensure prompt replacement of critical components. These will be stored in a secure location with controlled access.

Configuration Management

1. Update documentation and software archives with any minor changes to software made during maintenance work.
2. Verify and record operating systems and databases.
3. Record system software revisions and update levels.
4. Archive software in designated offsite Honeywell storage facility, on an annual basis.
5. Provide offline software imaging for disaster recovery procedures, updated on a regular basis.

Front End / PC Service

1. Verify operation of personal computer and software:
2. Check for PC errors on boot up
3. Check for Windows errors on boot up
4. Check for software operations and performance, responsiveness of system, speed of software
5. Routinely backup system files, on an annual basis:
6. Trend data, alarm information and operator activity data
7. Custom graphics and other information
8. Ensure disaster recovery procedures are updated with current files
9. Clean drives and PC housing, on an annual basis:
10. Open PC and remove dust and dirt from fans and surfaces

11. Open PC interface assemblies and remove dust and dirt
12. Clean and verify operation of monitors.
13. Verify printer operation, check ribbon or ink.
14. Initiate and check log printing functions.
15. Verify modem operation (if applicable).
16. Review IVR schedule for alarms and review (if applicable).

Temperature Controls

UNIT VENTS

Services Performed

Annual Inspection

1. Inspect motor and lubricate.
2. Lubricate fan bearings.
3. Inspect coil(s) for leaks.
4. Vacuum interior.
5. Test operation of unit controls.

PUMPS

Services Performed

Preseason Inspection

1. Tighten loose nuts and bolts.
2. Check motor mounts and vibration pads.
3. Inspect electrical connections and contactors.

Seasonal Start-up

1. Lubricate pump and motor bearings per manufacturer's recommendations.
2. Visually check pump alignment and coupling.
3. Check motor operating conditions.
4. Inspect mechanical seals or pump packing.
5. Check hand valves.

Mid-season Inspection

1. Lubricate pump and motor bearings as required.
2. Inspect mechanical seals or pump packing.
3. Ascertain proper functioning.

Seasonal Shut-down

1. Switch off pump.
2. Verify position of hand valves.
3. Note repairs required during shut-down.

PACKAGED AIR-CONDITIONING SYSTEMS

Services Performed

Preseason Inspection

1. Energize crankcase heater.
2. Lubricate fan and motor bearings per manufacturer's recommendations.
3. Check belts and sheaves. Adjust as required.
4. Lubricate and adjust dampers and linkages.
5. Check condensate pan.

Seasonal Start-up

1. Check crankcase heater operation.
2. Check compressor oil level.
3. Inspect electrical connections, contactors, relays, operating and safety controls.
4. Start compressor and check operating conditions. Adjust as required.
5. Check refrigerant charge.

6. Check motor operating conditions.
7. Inspect and calibrate temperature, safety and operational controls, as required.
8. Secure unit panels.
9. Pressure wash all evaporator and condenser coils (if applicable)
10. Log all operating data.

Mid-season Inspection
1. Lubricate fan and motor bearings per manufacturer's recommendations.
2. Check belts and sheaves. Adjust as required.
3. Check condensate pan and drain.
4. Check operating conditions. Adjust as required.
5. Log all operating data.

Seasonal Shut-down *
1. Shut down per manufacturer's recommendations.

* If no Shut-down is required then (2) Mid-season Inspections are performed

BOILERS

Services Performed

Preseason Inspection
1. Inspect fireside of boiler and record condition.
2. Brush and vacuum soot and dirt from flues (not chimneys) and combustion chamber.
3. Inspect firebrick and refractory for defects.
4. Visually inspect boiler pressure vessel for possible leaks and record condition.
5. Disassemble, inspect and clean low-water cutoff.
6. Check hand valves and automatic feed equipment. Repack and adjust as required.
7. Inspect, clean and lubricate the burner and combustion control equipment.
8. Reassemble boiler.
9. Check burner sequence of operation and combustion air equipment.
10. Check fuel piping for leaks and proper support.
11. Review manufacturer's recommendations for boiler and burner start-up.
12. Check fuel supply.
13. Check auxiliary equipment operation.

Seasonal Start-up
1. Inspect burner, boiler and controls prior to start-up.
2. Start burner and check operating controls.
3. Test safety controls and pressure relief valve.
4. Perform combustion analysis.
5. Make required control adjustments.
6. Log all operating conditions.
7. Review operating procedures and owner's log with boiler operator.

Mid-season Inspection
1. Review operator's log.
2. Check system operation.
3. Perform combustion analysis.
4. Make required control adjustments.
5. Log all operating conditions.
6. Review operating procedures and log with boiler operator.

Seasonal Shut-down
1. Review operator's log.
2. Note repairs required.

SECTION F DESIGN APPROACH

In accordance with the ESIP PL 2012, c.55 as part of the implementation process, an agreement between the Montville BOE and Honeywell will determine the energy conservation measures (ECM's) to be implemented. The services of a NJ Licensed Engineering firm and / or Architectural firm shall then be secured to properly comply with local building codes, compliance issues and NJ Public contracts law. Specifications will be designed and developed to exact standards as recommended by Honeywell to achieve all savings outlined in this Energy Savings Plan (ESP). Once specifications are completed, Honeywell will publicly solicit contractors capable of meeting the requirements of the specification for each trade. However, even before the completion of the bidding process, Honeywell project management will be engaged to maintain the overall project schedule and ensure the Montville BOE's expectations are met. An overview of these activities and functions are detailed below.

1. Safety Management Plan

All of Honeywell's Project Management Plans begin with safety. By integrating health, safety and environmental considerations into all aspects of our business, we protect our customers, our people and the environment, achieve sustainable growth and accelerated productivity, drive compliance with all applicable regulations and develop the technologies that expand the sustainable capacity of our world. Our health, safety and environment management systems reflect our values and help us meet our customer's needs and our business objectives.

Honeywell's Safety Management Plan is provided in Appendix 5.

2. Project Management Process

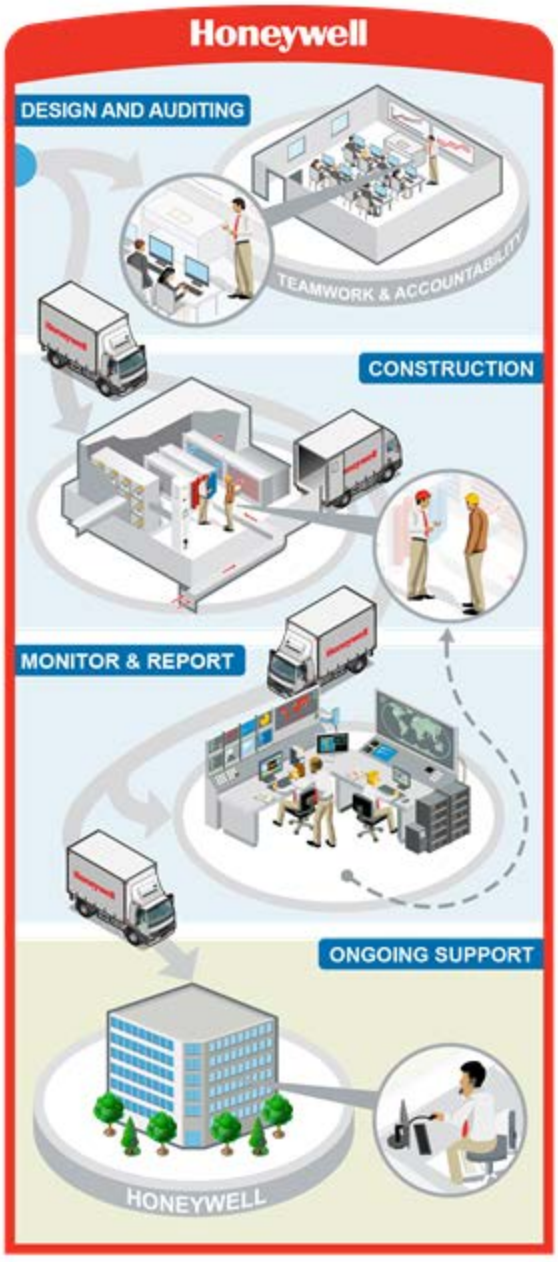
Honeywell approaches any ESIP project with a systematic, tested and proven delivery process based upon industry best practices including strong project management, open and collaborative communication, superior technical design and state of the art technologies. We go above and beyond, with multiple NJ delivery teams to ensure sufficient resources, meticulous and thorough training and commissioning, and robust maintenance planning that goes the extra mile for the long term. Honeywell excels at project delivery because of our experience in New Jersey delivering ESIP projects with results that meet or exceed expectations.

Honeywell will demonstrate our partnership-based commitment to The Montville BOE throughout the development and delivery of your ESIP project, as we have done for dozens of other public entities throughout New Jersey under the ESIP Law. Our approach is backed by our references and track record and highly experienced engineering resources, which will be fully utilized to help you achieve your unique project goals and requirements.

Honeywell prescribes four phases in the ESIP Process that constitutes your project, including:

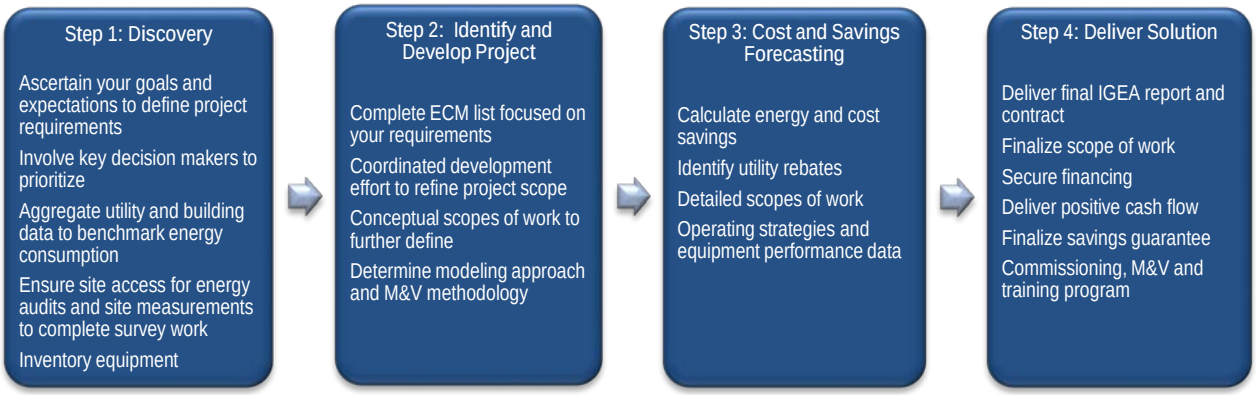
- Phase 1: Investment Grade Energy Audit (IGEA)
- Phase 2: Project Implementation
- Phase 3: Commissioning and Training
- Phase 4: Energy Savings Guarantee Period

The IGEA will commence with a kickoff meeting between key project stakeholders of the Montville BOE and Honeywell to review the ESIP Process, including the expectations of both parties during the IGEA,



audit parameters, reporting methods, building access protocols, availability of utility and building data, et cetera. Phase 2 will commence after our kickoff meeting has concluded with agreed upon next steps.

Honeywell takes a holistic approach in development of a comprehensive solution that is customized to meet your operational and facility needs and project goals. Our integrated project delivery approach supports continuous and collaborative communication between key stakeholders throughout the process. Our IGEA development process includes the following steps:



Step 1: Discovery

The first step of your IGEA is to gain a thorough comprehension of the Montville BOE's key priorities and requirements. Honeywell will work with you to identify what your key needs and goals include and investigate your buildings and systems with that in mind during this step.

Honeywell will initiate your IGEA shortly after formal selection with a kickoff meeting involving all key project decision makers of the Montville BOE and Honeywell. The purpose of this meeting is to establish preliminary project expectations and define key next steps of the process to inform the IGEA.

Honeywell will develop a customized plan for developing an efficient, cost effective and solutions based project including schedule, finance, performance requirements and scheduling activities.

Honeywell will schedule site visits to commence at the earliest convenience. Utility data is a key component used for establishing your energy baseline to project potential energy savings. Building plans and operating schedules will assist Honeywell to focus our time during the site visits and serve to provide the means for our engineers to complete their calculations. Data required for this step includes 24 months of electric, thermal, water/sewer data, original and renovation drawings, equipment lists, equipment operating schedules, occupancy data and maintenance records and repair costs.

Our goal for the site surveys is to understand your systems in each facility and to identify potential energy conservation measures (ECMs) for inclusion in your final project scope. This step allows Honeywell to determine needed improvements by evaluating each building and its systems in terms of condition, performance and age, including lighting and HVAC systems, Building Automation Systems, building envelopes, electrical distribution, domestic water and heating systems, et cetera.

Step 2: Identify and Develop Project

Honeywell will take the findings of our earlier diagnostic phase to develop solutions that address your priorities and key needs as ascertained in Step 1. Our collaborative, solutions based approach will allow you to maximize savings so as to invest more into modernizing buildings and generate maximum rebates to help deliver the most positive cash flow available.

Our primary objective is to ensure quality control and on time delivery throughout your project. Your project will have a dedicated team consisting of project management and engineering who have helped deliver similarly sized project under ESIP in recent past.

Honeywell will create an exhaustive ECM list following the completion of the site survey process. Each opportunity is then analyzed individually to determine both economic and construction feasibility. Input from the Montville BOE is critical to determine how each ECM fits within your overall project priorities. Honeywell's ECM Opportunity Funnel will help further narrow down the list of potential ECMs to your final ESIP project scope, by analyzing all aspects of your energy consumption to deliver an optimal project scope based on realistic savings potential. Our unique collaborative approach ensures that we deliver on your expectations while providing for turnkey solutions that are cost effective.

Step 3: Cost and Savings Forecasting

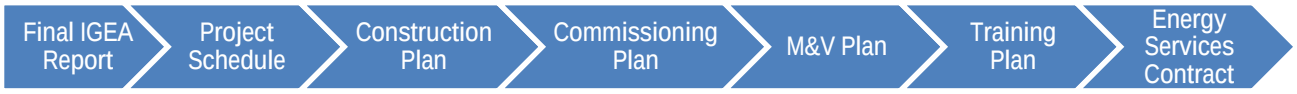
Honeywell will then move on to analyze and quantify your unique savings guarantee utilizing the Montville BOE's dedicated ESIP Team. During this step, we will quantify energy savings by identifying the scope of work and its impact on your facilities and systems. We will measure individual ECMs based on how they will impact future performance of the building as a whole. This will help to ensure that the ECM savings are accounted for only once. Results are then subject to peer reviews to verify accurate modeling and savings forecasts based on the proposed scope of work.

Honeywell's unique approach to engineering is why we often exceed the savings guarantee of our contracts.

Step 4: Deliver Solution

Honeywell will leverage our experience delivering more than two dozen NJ ESIP projects since 2009 to help the Montville BOE complete a successful project on time that maximizes realistic savings, cash rebates and positive cash flow. We have learned through this unrivaled experience that what matters most is to meet your expectations and ensure your involvement in the decision-making process. REACT (Rebate Energy Analysis Constructability Tool) will provide for an interactive solution development experience designed to maximize New Jersey Office of Clean Energy rebates. Our No Change Orders policy (which helps distinguish Honeywell from the competition) will further reduce risk and enhance project results. And our in-house finance team (Honeywell Global Finance) will work to ensure that you secure the most competitive financial offering and interest rate available. No ESCO offers more value throughout the ESIP Process than Honeywell.

Our deliverables during this final phase will include:



A. Honeywell Performance Contracting

Honeywell is the undisputed performance contracting market leader in the Northeast. Honeywell's Guaranteed Performance Contracting, which we pioneered in the early 1980's, has surpassed the $2 billion mark in cumulative sales. Our performance contracting business features specialized and dedicated resources, including people with expertise specifically to address the needs of our customers. Our portfolio of business experience in the region is over 400 projects and over $500 million in project investment.

B. Project Management Policy: Honeywell's Commitment to Health, Safety and the Environment

All of Honeywell's Project Management Plans begin with safety. By integrating health, safety and environmental considerations into all aspects of our business, we protect our customers, our people and the environment, achieve sustainable growth and accelerated productivity, drive compliance with all applicable regulations and develop the technologies that expand the sustainable capacity of our world. Our health, safety and environment management systems reflect our values and help us meet our customer's needs and our business objectives.

Our Safety Commitment to the Montville BOE

In today's world, nothing is more important than safeguarding our families at home, at work and at school. Through Honeywell's safety awareness process, we commit to our customers to protect and safeguard our construction sites, our employees, sub-contractors, and your staff.

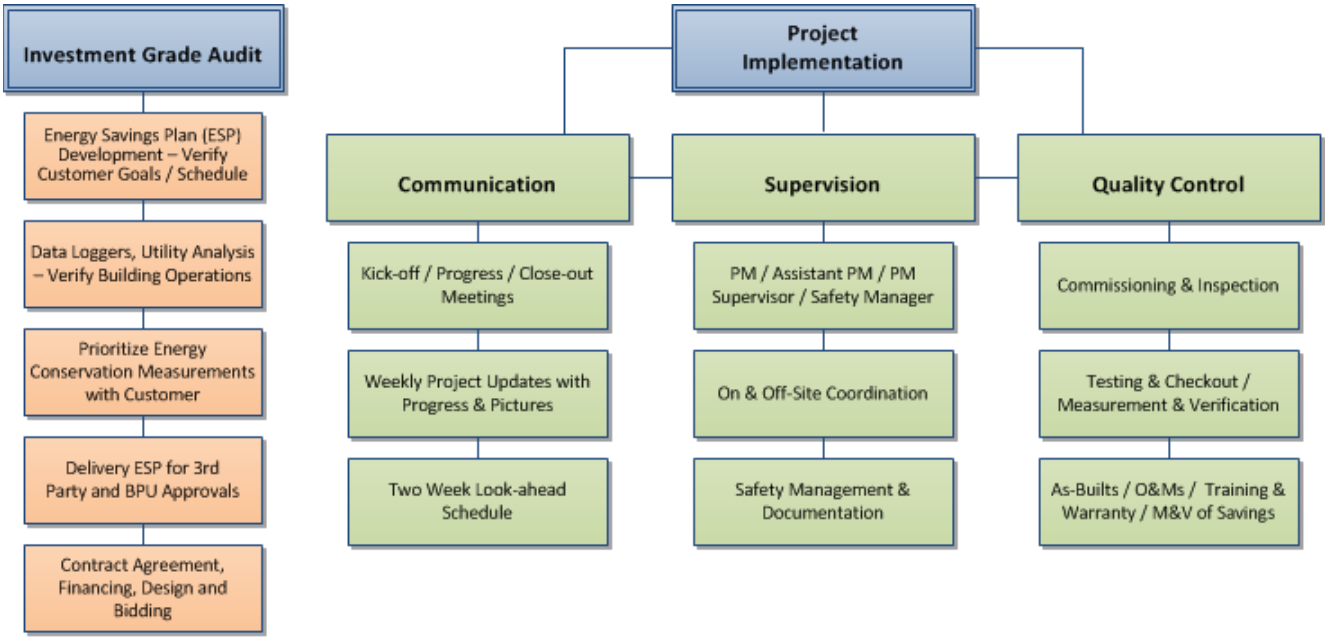
Our projects all begin with the following steps:

- Safety Training for Employee's and Sub-contractors
- Detailed Work Schedules around the day
- Detailed Background Checks of Personnel
- Detail Logs of Sub Contractor Personnel
- On-Site Logs of Time Sheets, Contact Information for All Personnel
- Clearly Displayed Identification Badges of All Construction Personnel
- On-Site Daily Supervision of All Sub-contractors
- Detailed and Weekly Reviews of Accident Reports and Remediation Strategy

We protect the safety and health of our customers and employees through prevention of illness, injury and pollution.

- We actively promote and develop opportunities for expanding sustainable capacity by increasing fuel efficiency, improving security and safety, and reducing emissions of harmful pollutants.
- We are committed to compliance with all of our health, safety, environmental and legal requirements everywhere we operate
- Our commitment to health, safety and the environment is an integral aspect of our design of products, processes and services, and of the lifecycle management of our products.
- Our management systems apply a global standard that provides protection of both human health and the environment during normal and emergency situations
- We identify, control and endeavor to reduce emissions, waste and inefficient use of resources and energy.
- We abide by the company's own strict standards in cases where local laws are less stringent.
- Our senior leadership and individual employees are accountable for their role in meeting our commitments.
- We measure and periodically review our progress and strive for continuous improvement.
- These are our commitments to health, safety, and the environment, and to creating a safe, clean environment everywhere we operate.

C. Project Management Process



The project management process applies technical knowledge, people and communication skills, and management talent in an on-site, pro-active manner to ensure that our contract commitments are met on time, within budget, and at the quality you expect.

A Honeywell Project Management Plan defines plans and controls the tasks that must be completed for your project. But more than task administration, our project management process oversees the efficient allocation of resources to complete those tasks.

Each project and each customer's requirements are unique. At Honeywell, we address customer needs through a formal communication process. This begins by designating one of our project managers to be responsible for keeping the customer abreast of the status of the project.

As the facilities improvements portion of the partnership begins, the Project Manager serves as a single focal point of responsibility for all aspects of the partnership. The Project Manager monitors labor, material, and project modifications related to the Montville BOE/Honeywell partnership and makes changes to ensure achievement of performance requirements in the facilities modernization component. The Project Manager regularly reviews the on-going process of the project with the customers.

The Project Manager will develop and maintain effective on-going contact with the Montville BOE and all other project participants to resolve issues and update project status.

There are several challenges in this position. The Project Manager must staff the project and create a work force capable of handling the technologies associated with the project (pneumatic or electric/electronic controls, mechanical systems, etc.), and plan for and use these personnel to achieve optimum results focused on occupant comfort and guarantee requirements.

3. Construction Management

Prior to any work in the buildings, our Project Manager will sit down with your administrative and building staff to outline the energy conservation upgrades that we will be installing in their building. We will discuss proper contractor protocol of checking in and out of the buildings on a daily basis, wearing identifiable shirts, identification badges, and checking in with your facilities staff. We will coordinate certain projects for different times of the day so we do not interrupt the building and learning environments. Our staff will work a combination of first and second shifts to accomplish the pre-set implementation schedule.

Communication is the key success factor in any construction management plan, and our project manager will be the key focal point during the installation process.
Our team will prevent schedule slippages by continuously tracking the location of all equipment and components required for the project. We make sure all equipment and components will be delivered on time prior to the scheduled date of delivery. Our thorough survey, evaluation and analysis of existing conditions, performed prior to the commencement of construction, will also prevent schedule slippages.

Honeywell is required to subcontract various portions of our projects to contractors. Within the Montville BOE project, all subcontractors will be selected in accordance with New Jersey public contracts law. Typical areas that are subcontracted are as follows:

- Electrical Installation
- Lighting Retrofits
- HVAC Installation (depends upon the project size and scope)
- Associated General Contracting specialty items to support the project etc., (ceilings, windows, concrete, structural steel, roofing, demolition and removal of equipment, painting and rigging)

Where possible under New Jersey public contracts law, Honeywell uses the following guidelines in hiring subcontractors to perform work on our projects.

- Local Presence in the Community (Customer Recommendations)
- Firm's Qualifications and WBE/MBE Status
- Firm's Financial Stability
- Ability to perform the work within the project timeline
- Price
- Ability to provide service on the equipment or materials installed over a long period of time.

Approval of subcontractors that Honeywell proposes to use lies with the Montville BOE.

4. Commissioning

Honeywell provides full commissioning of energy conservation measures (ECM's) as part of our responsibility on this project. We will customize this process based on the complexity of ECMs. Specifically, Honeywell will be responsible for start-up and commissioning of the new equipment and systems to be installed during the project. This will include verifying that the installed equipment meets specifications, is installed and started up in accordance with manufacturer's recommendations, and operates as intended. A commissioning plan will be prepared that describes the functional tests to be performed on the equipment and the acceptance criteria.

Prior to customer acceptance of the project, Honeywell submits the final commissioning report containing signed acceptance sheets for each ECM. Signed acceptance sheets are obtained upon demonstrating the functionality of each ECM to a Montville BOE appointed representative.

Additionally, Honeywell provides training for facility operators and personnel as needed when each ECM is completed and placed into service. All training is documented in the final commissioning report.

After the completion of the Honeywell commissioning effort, in accordance with New Jersey ESIP legislation, the Montville BOE will be required to secure the services of a 3rd party independent firm in order to verify that the new equipment and systems meet the standards set forth in the Energy Savings Plan. To maintain the independence of this review, these costs must be born directly by the Montville BOE. However, at the option of the Montville BOE, these services can be financed as a portion of the total project cost.

5. Installation Standards

When Honeywell designs a solution, we consider current and future operations. For any upgrades, we install, we follow building codes/standards, which dictate certain standards for energy or building improvements. Listed in tables following this section are standards for building design. During the life of the agreement, there is a partnership approach to maintaining these standards for reasons of comfort and reliability. For lighting our standard is to meet or exceed Illuminating Engineering Society (IES) light level requirements, achieving the relevant standards wherever possible.

In the case of fluorescent lighting upgrades, we recommend that a group re-lamping of lamps be done approximately five years after the initial installation depending upon run times. Your building facility staff, on an as needed basis, can complete normal routine maintenance of lamps and ballasts. This maintains the quality of the lighting levels, and color rendering qualities of the lamps.

Space temperatures will be set by the energy management system and local building controls, and will be maintained on an annual basis. Flexibility will be maintained to regulate space temperatures as required to accommodate building occupant needs.

Your facility staff and building personnel will operate the energy management system with ongoing training and support from Honeywell. Therefore, both the Montville BOE and Honeywell will maintain the standards of comfort. The comfort standards will be maintained throughout the life of the agreement through sound maintenance planning and services recommended as part of this ESP.

Regarding ventilation, Honeywell will upgrade ventilation to meet current standards in those areas where our scope of work involves upgrades to or replacement of systems providing building ventilation. We generally will not upgrade ventilation in those areas where our work doesn't involve the upgrade or replacement of systems or equipment providing ventilation to a building or facility.

Heating and Cooling Standards

Heating Temperatures	Cooling Temperatures	Unoccupied Temperatures
70-72° F	72-74° F	58-62° F

Honeywell uses a variety of in-house labor as well as subcontractors to install the energy conservation measures. We have on staff trained professionals in fire, security, energy management systems, all temperature control systems, and HVAC. However, per the ESIP law, all trades will be publicly bid except for specific controls applications. Listed below is a sampling of some of the disciplines that would apply to the Montville BOE:

Improvements	Honeywell	Subcontractor
Engineering Design/Analysis	X	
Technical Audit	X	
Construction Administration/Management	X	
On-Site Construction Supervision	X	
Installation of Energy Management System	X	X
Manufacturer of Energy Management Equipment	X	X
Installation of HVAC/Mechanical Equipment		X
Installation of Renewable Technology		X
Installation of Building Envelope		X
Energy Supply Management Analysis/Implementation	X	
Installation of Boilers		X
Maintenance of Energy Management Equipment	X	X
Manufacturer/Installation of Temperature Controls	X	X
Monitoring/Verification Guarantee	X	
Training of Owner Staff	X	
Financial Responsibility for Energy Guarantees	X	

Hazardous Waste Disposal or Recycling

Honeywell disposes of all PCB ballasts or mercury containing materials removed as part of the project per EPA guidelines. Honeywell will complete all of the required paperwork on behalf of the Montville BOE. Honeywell will work with the Montville BOE to review your hazardous material reports, and will identify the areas where work will be completed so that the Montville BOE can contract to have any necessary material abatement completed.

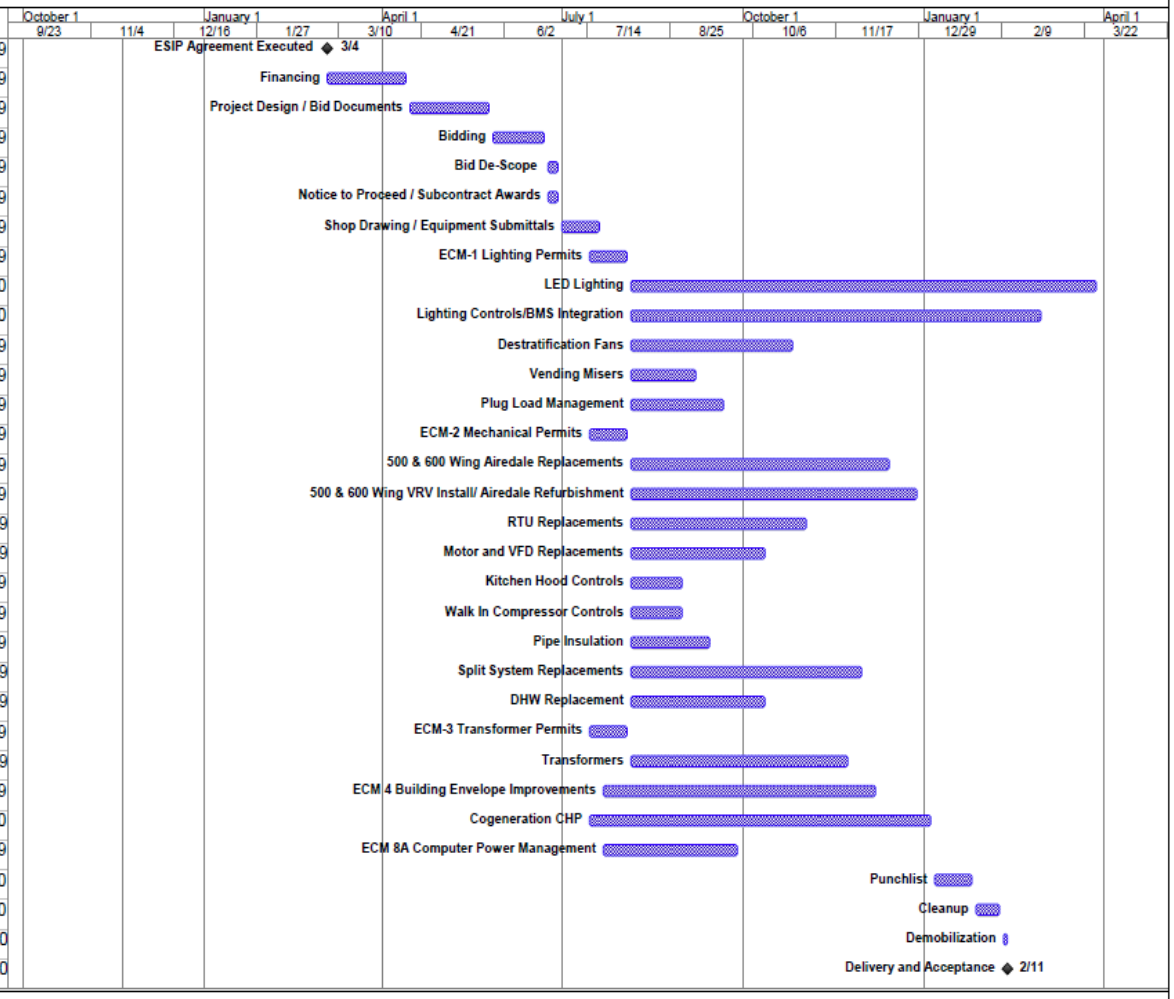
Honeywell can help schedule or coordinate waste removal, but does not contract for, or assume responsibility for, the abatement work. Honeywell also has the capabilities to assist the Montville BOE in working with the EPA under compliance management issues. We also develop and manufacture automated systems to track and report a wide variety of environmental factors.

6. Implementation Schedule

Attached please find a sample schedule for construction and completion of the Project.

Montville School District
Honeywell Energy Project
ESP Schedule

ID	Task Name	Start	Finish
1	ESIP Agreement Executed	Mon 3/4/19	Mon 3/4/19
2	Financing	Mon 3/4/19	Fri 4/12/19
3	Project Design / Bid Documents	Mon 4/15/19	Fri 5/24/19
4	Bidding	Mon 5/27/19	Fri 6/21/19
5	Bid De-Scope	Mon 6/24/19	Fri 6/28/19
6	Notice to Proceed / Subcontract Awards	Mon 6/24/19	Fri 6/28/19
7	Shop Drawing / Equipment Submittals	Mon 7/1/19	Fri 7/19/19
8	ECM-1 Lighting Permits	Mon 7/15/19	Fri 8/2/19
9	LED Lighting	Mon 8/5/19	Fri 3/27/20
10	Lighting Controls/BMS Integration	Mon 8/5/19	Fri 2/28/20
11	Destratification Fans	Mon 8/5/19	Fri 10/25/19
12	Vending Misers	Mon 8/5/19	Fri 9/6/19
13	Plug Load Management	Mon 8/5/19	Fri 9/20/19
14	ECM-2 Mechanical Permits	Mon 7/15/19	Fri 8/2/19
15	500 & 600 Wing Airedale Replacements	Mon 8/5/19	Fri 12/13/19
16	500 & 600 Wing VRV Install/ Airedale Refurbishment	Mon 8/5/19	Fri 12/27/19
17	RTU Replacements	Mon 8/5/19	Fri 11/1/19
18	Motor and VFD Replacements	Mon 8/5/19	Fri 10/11/19
19	Kitchen Hood Controls	Mon 8/5/19	Fri 8/30/19
20	Walk In Compressor Controls	Mon 8/5/19	Fri 8/30/19
21	Pipe Insulation	Mon 8/5/19	Fri 9/13/19
22	Split System Replacements	Mon 8/5/19	Fri 11/29/19
23	DHW Replacement	Mon 8/5/19	Fri 10/11/19
24	ECM-3 Transformer Permits	Mon 7/15/19	Fri 8/2/19
25	Transformers	Mon 8/5/19	Fri 11/22/19
26	ECM 4 Building Envelope Improvements	Mon 7/22/19	Fri 12/6/19
27	Cogeneration CHP	Mon 7/15/19	Fri 1/3/20
28	ECM 8A Computer Power Management	Mon 7/22/19	Fri 9/27/19
29	Punchlist	Mon 1/6/20	Fri 1/24/20
30	Cleanup	Mon 1/27/20	Fri 2/7/20
31	Demobilization	Mon 2/10/20	Tue 2/11/20
32	Delivery and Acceptance	Tue 2/11/20	Tue 2/11/20



Project: Montville
Date: Tue 11/20/18

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Progress	
Split	External Tasks	Inactive Summary	Manual Summary	Deadline	
Milestone	External Milestone	Manual Task	Start-only		
Summary	Inactive Task	Duration-only	Finish-only		

Page 1

Montville ESP Schedule

APPENDIX 1 INDEPENDENT ENERGY AUDITS

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Local Government Energy Audit:
Energy Audit Report

Hilldale Elementary School

123 Konner Avenue

Pine Brook, NJ 07058

Montville Township BOE

September 15th, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Hilldale Elementary School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Hilldale Elementary School is a 37,055 square foot facility comprised of various space types such as classrooms, gymnasium/cafeteria, libraries and a mechanical space. The building has single story and serves students from kindergarten through fifth grade. This is a 10 month school and the building schedule on a regular day is from 8AM-3PM.

Heating in the building is supplied by three condensing boilers and space cooling is provided by packaged units and split units. Lighting at Hilldale Elementary School consists of aged and inefficient T8 and T12 linear tubes for majority spaces. Smaller spaces such as boiler room and main office are lit using compact fluorescents and incandescent bulbs. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 5 measures which together represent an opportunity for Hilldale Elementary School to reduce annual energy costs by roughly $11,755 and annual greenhouse gas emissions by 98,906 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 8.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Hilldale Elementary School's annual energy use by 17%.

Figure 1 – Previous 12 Month Utility Costs

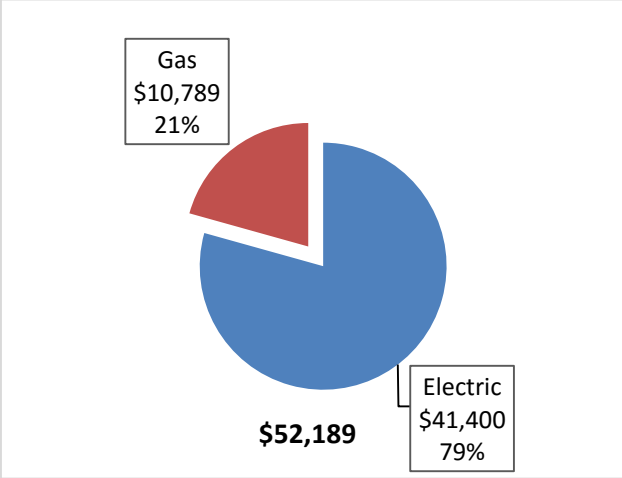
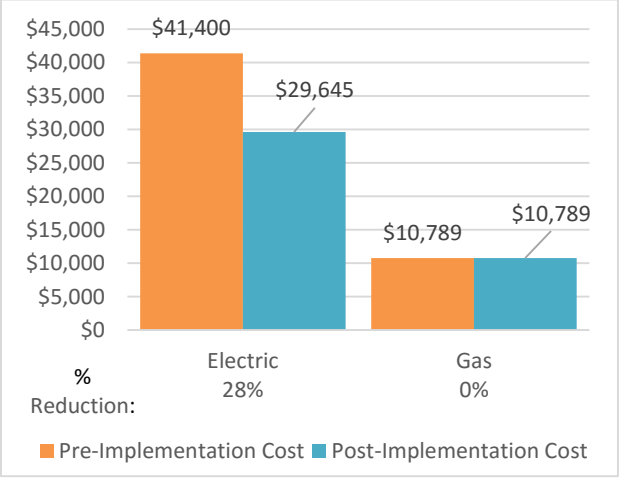


Figure 2 – Potential Post-Implementation Costs



A detailed description of Hilldale Elementary School's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**78,094**	**21.6**	**0.0**	**$9,346.19**	**$59,552.62**	**$3,405.00**	**$56,147.62**	**6.0**	**78,640**
ECM 1	Install LED Fixtures	Yes	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and	Yes	52,828	14.4	0.0	$6,322.33	$41,069.63	$0.00	$41,069.63	6.5	53,197
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,939	6.8	0.0	$2,745.36	$17,310.96	$3,105.00	$14,205.96	5.2	23,100
Lighting Control Measures			**4,098**	**1.1**	**0.0**	**$490.50**	**$4,398.00**	**$585.00**	**$3,813.00**	**7.8**	**4,127**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127
Electric Unitary HVAC Measures			**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**
	Install High Efficiency Electric AC	No	11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913
Domestic Water Heating Upgrade			**4,197**	**0.0**	**0.0**	**$502.25**	**$136.23**	**$0.00**	**$136.23**	**0.3**	**4,226**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226
TOTAL OF ALL ECMS EVALUATED			**98,219**	**31.4**	**0.0**	**$11,754.73**	**$102,988.57**	**$6,382.00**	**$96,606.57**	**8.2**	**98,906**
TOTAL OF ALL ECMS RECOMMENDED			**86,389**	**23**	**0**	**10,339**	**64,087**	**3,990**	**60,097**	**5.8**	**86,993**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Energy Efficient Practices

TRC Energy Services also identified 9 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Hilldale Elementary School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Hilldale Elementary School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. For details on our evaluation and on-site generation potential, please refer to section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important

because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	973-331-7100 x 2228
Rich Medwin	Maintennace Supervisor	Rrichard.medwin@montville.net	973-331-7100 x 2250
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 14, 2017, TRC Energy Services performed an energy audit at Hilldale Elementary School located in Pine Brook, NJ. TRC Energy Services' team met with Ted Keane to review the facility operations and help focus our investigation on specific energy-using systems.

Hilldale Elementary School is a 37,055 square foot facility comprised of various space types such as classrooms, gymnasium/cafeteria, libraries and a mechanical space. The building has single story and serves students from kindergarten through fifth grade. This is a 10 month school and the building schedule on a regular day is from 8AM-3PM.

The building was constructed in 1974 and an addition in 2005. The addition primarily consists of classrooms. Space heating in the building is supplied by three gas fired condensing boilers and space cooling is provided by packaged units and split units. Lighting at Hilldale Elementary School consists of aged and inefficient T8 and T12 linear tubes for majority spaces. Smaller spaces such as boiler room and main office are lit using compact fluorescents and incandescent bulbs.

2.3 Building Occupancy

The typical schedule is presented in the table below. It was mentioned by the site contact that the gymnasium and libraries are used for after school activities and also during some weekends for other events. During a typical day, the facility is occupied by approximately 55 full time staff including teachers, admin and maintenance and 340 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Hilldale Elementary School	Weekday	8AM - 3PM
Hilldale Elementary School	Weekend	No operation

2.4 Building Envelope

The building is made of interconnected structures made of concrete blocks and has a concrete (and window) façade. The building has pitched roof on the original building with gravel layer and flat roof on the 2005 addition with EPDM membrane. Due to inclement weather, the auditor onsite did not have roof access. Other resources were used to obtain this information. Both sections look fairly new and in good condition. The windows in the building are double pane and the doors are made of aluminum or aluminum framed glass. These were observed to be in good condition.

Image 1 Sample of building envelope pictures

2.5 On-Site Generation

Hilldale Elementary School currently does not have any on-site electric generation systems installed.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps and 60 Watt fluorescent T12 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). The fixtures are 4-foot or 8 foot with varying number of tubes in each one of them.

A small area of the building and the majority of the office spaces are primarily lit with 26-watt or 42-watt CFL lamps in recessed can ceiling fixtures. The entrance hallway is lit using LED lamps.

Lighting control in most spaces is provided by manual wall switches. Some spaces such as the oiler rooms and, staff restroom, music rooms and a few offices have occupancy sensors to control the lights. The occupancy sensors are wall mounted.

Majority of the building's exterior lighting consists of metal halide wall pack fixtures. We also observed one LED fixture and a couple of compact fluorescent fixtures. All the EXIT lights are 2-watt LED fixtures.

Image 2 Typical lighting fixtures at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Hot Water (or Steam) Heating System

The hot water system consists of three gas fired condensing hot water boiler from MACH. The boilers have an output capacity of 987 MBh each and a combustion efficiency of 94%. Out of the three boilers, one is the lead boiler installed with the temperature sensor controls. This controls the other two boilers based on the outside air temperature.

The hot water is circulated to the various parts (classrooms, offices and gymnasiums) of the school using two variable speed pumps of 10hp capacity. The boilers are also equipped with jockey pumps (one each) used to maintain the loop temperature by circulating the water continuously. The heated air is distributed in the respective zones using terminal units such as unit ventilators and hot water baseboard heaters. The unit ventilators placed in the classrooms in the original section of the building are old and function with lower accuracy and have pneumatic controls.

The 2005 addition of the building has newer, self-contained unit ventilators with hot water coils and DX cooling coils. These unit ventilators along with the HVV unit in the gym and other parts of the newer addition are controlled using DDC building management system provided by Honeywell.

Image 3 Sample of boilers, terminal units, controls and distributing pumps at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Direct Expansion Air Conditioning System (DX)

One 6 ton packaged unit is placed on the roof of the original building that serves the main offices. The original section of the building has 2.5 ton split AC units (Fujitsu) per classroom serving all classrooms. These are controlled using thermostats in the individual rooms. The newer section of the building has self-contained unit ventilators with DX coils that have condensers on the roof top. The site had mentioned (in our response to the RFI) that this section has (2) 2.5 ton and (6) 3.5 ton unit ventilators. These are controlled using the BMS system provided by Honeywell along with the heat in these spaces.

Image 4 Split units and respective controls in the older and newer section of the building

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of three electric hot water heaters. Two of these have an input rating of 4.5kW (AO Smith and Rheem) and a tank capacity of 50 gallons serving the sinks and restrooms. There is one smaller water heater serving just the art room with an input capacity 1.4kW and a tank capacity of 4 gallons.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Building Plug Load

There are roughly 76 computer work stations and 23 laptops throughout the facility. The students also carry chrome books that are charged using the chrome book carts during school hours. Other plug loads found in the school are printers, paper shredder, projectors and smart board. There are also kitchenette equipment like coffee machines, microwaves, refrigerators, water dispensers etc. There is no centralized PC power management software installed.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

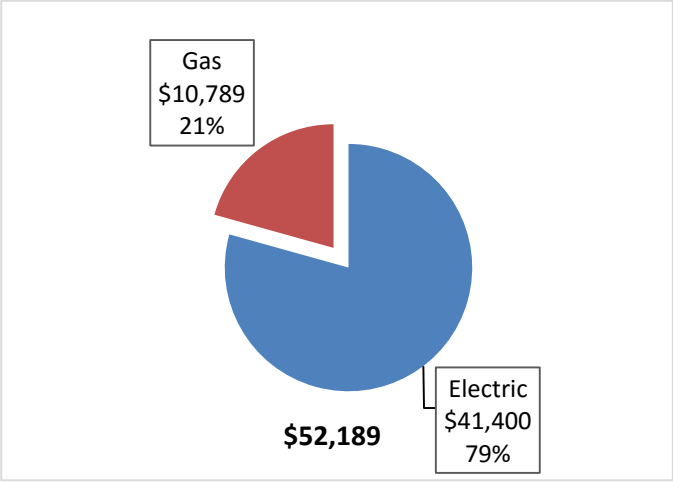
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Hilldale Elementary School		
Fuel	**Usage**	**Cost**
Electricity	345,926 kWh	$41,400
Natural Gas	7,799 Therms	$10,789
Total		**$52,189**

The current annual energy cost for this facility is $52,189 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.120/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Sol. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

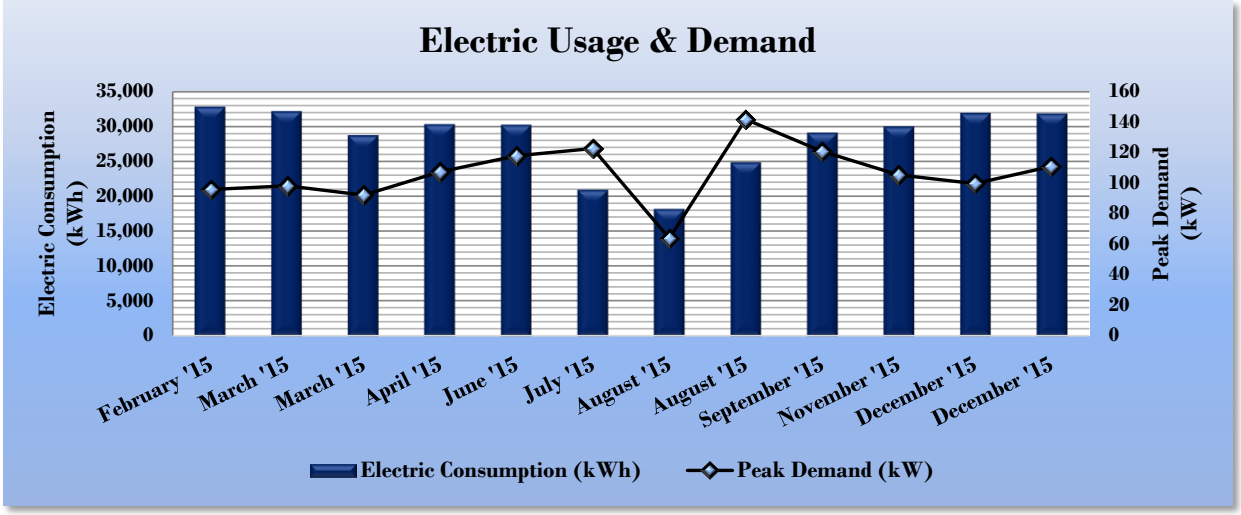


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Hilldale Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/18/15	30	32,720	96	$556	$3,756
3/17/15	27	32,080	98	$571	$3,727
4/15/15	29	28,640	92	$495	$3,340
5/14/15	29	30,240	107	$546	$3,566
6/16/15	33	30,160	118	$649	$3,658
7/18/15	32	20,880	123	$677	$2,779
8/17/15	30	18,160	64	$323	$2,159
9/14/15	28	24,800	142	$792	$3,277
10/14/15	30	29,040	121	$622	$3,520
11/19/15	36	29,920	106	$536	$3,524
12/16/15	27	31,840	100	$503	$3,679
1/13/16	28	31,760	111	$567	$3,735
Totals	**359**	**340,240**	**141.8**	**$6,837**	**$40,719**
Annual	**365**	**345,926**	**141.8**	**$6,951**	**$41,400**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.383/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

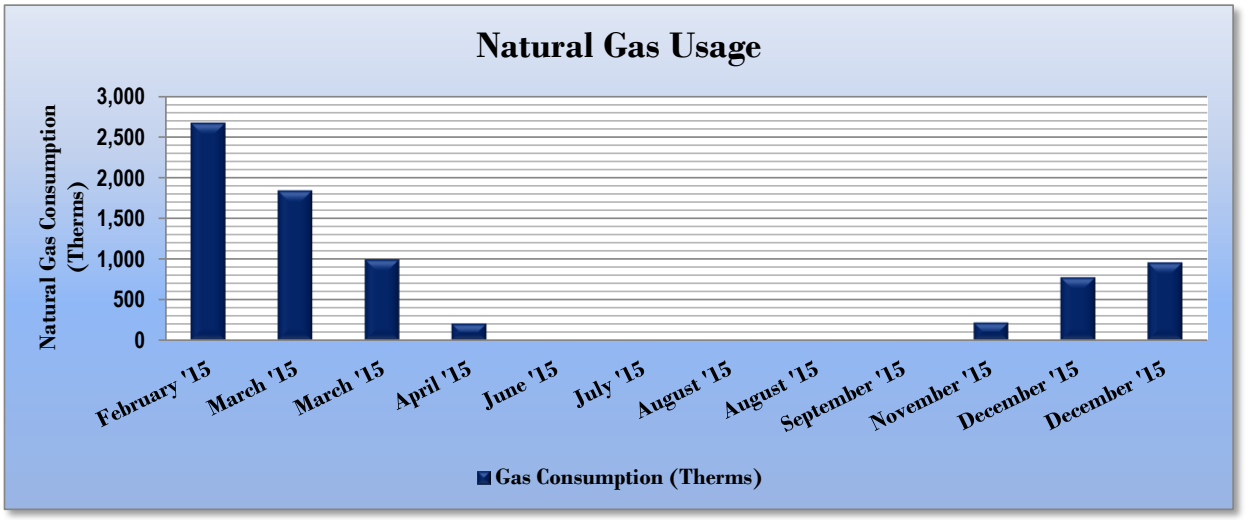


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Hilldale Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/18/15	30	2,674	$2,637
3/17/15	27	1,841	$1,943
4/15/15	29	995	$1,172
5/14/15	29	206	$519
6/16/15	33	1	$348
7/18/15	32	1	$348
8/17/15	30	1	$348
9/14/15	28	1	$348
10/14/15	30	1	$348
11/19/15	36	218	$450
12/16/15	27	774	$1,036
1/13/16	28	957	$1,112
Totals	**359**	**7,671**	**$10,612**
Annual	**365**	**7,799**	**$10,789**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Hilldale Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	122.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	52.9	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Hilldale Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	97.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	44.9	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 80.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

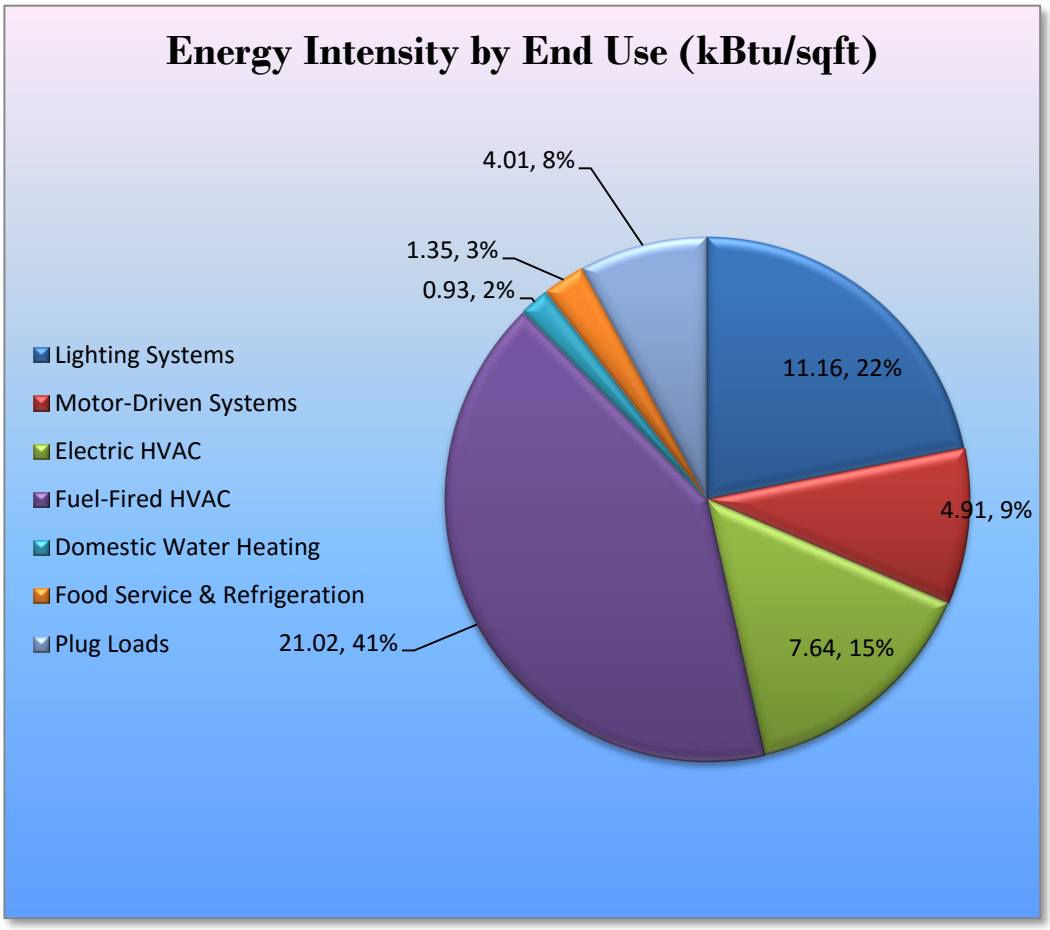
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Hilldale Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**78,094**	**21.6**	**0.0**	**$9,346.19**	**$59,552.62**	**$3,405.00**	**$56,147.62**	**6.0**	**78,640**
ECM 1	Install LED Fixtures	Yes	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and	Yes	52,828	14.4	0.0	$6,322.33	$41,069.63	$0.00	$41,069.63	6.5	53,197
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,939	6.8	0.0	$2,745.36	$17,310.96	$3,105.00	$14,205.96	5.2	23,100
Lighting Control Measures			**4,098**	**1.1**	**0.0**	**$490.50**	**$4,398.00**	**$585.00**	**$3,813.00**	**7.8**	**4,127**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127
Electric Unitary HVAC Measures			**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**
	Install High Efficiency Electric AC	No	11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913
Domestic Water Heating Upgrade			**4,197**	**0.0**	**0.0**	**$502.25**	**$136.23**	**$0.00**	**$136.23**	**0.3**	**4,226**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226
TOTAL OF ALL ECMS RECOMMENDED			**86,389**	**23**	**0**	**10,339**	**64,087**	**3,990**	**60,097**	**5.8**	**86,993**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**78,094**	**21.6**	**0.0**	**$9,346.19**	**$59,552.62**	**$3,405.00**	**$56,147.62**	**6.0**	**78,640**
ECM 1	Install LED Fixtures	Yes	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and	Yes	52,828	14.4	0.0	$6,322.33	$41,069.63	$0.00	$41,069.63	6.5	53,197
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,939	6.8	0.0	$2,745.36	$17,310.96	$3,105.00	$14,205.96	5.2	23,100

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343

Measure Description

We recommend replacing existing fixtures containing exterior fixtures with HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

Please note that the economics in the tables above do not include incentives for replacing T12 tubes in FY17. However this program has been modified for FY18 and we request you to check back while applying for incentives.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Measure Description

We recommend retrofitting existing 4-foot and 8-foot T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	363	0.0	0.0	$43.40	$107.51	$0.00	$107.51	2.5	365

Measure Description

We recommend retrofitting existing incandescent or compact fluorescent lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**4,098**	**1.1**	**0.0**	**$490.50**	**$4,398.00**	**$585.00**	**$3,813.00**	**7.8**	**4,127**
ECM 4	Install Occupancy Sensor Lighting Controls	4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all storage rooms, classrooms and offices areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 18 below.

Figure 18 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**4,197**	**0.0**	**0.0**	**$502.25**	**$136.23**	**$0.00**	**$136.23**	**0.3**	**4,226**
ECM 5	Install Low-Flow Domestic Hot Water Devices	4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 5: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 19 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**
Install High Efficiency Electric AC	11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913
TOTALS	**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913

Measure Description

We evaluated replacing standard efficiency split AC units (two 2.5 ton units and six 3.5 ton units serving the classrooms) with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

Although the AC units evaluated for replacement are 18 years old, the payback period on replacing these units are very high as an individual measure. We suggest that these be replaced as a package along with other measures which gives a return on investment in 8 years. Or, replace them with higher efficiency units when they absolutely come to the end of their useful life (which will not improve the payback but at this point it is necessary).

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.3 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

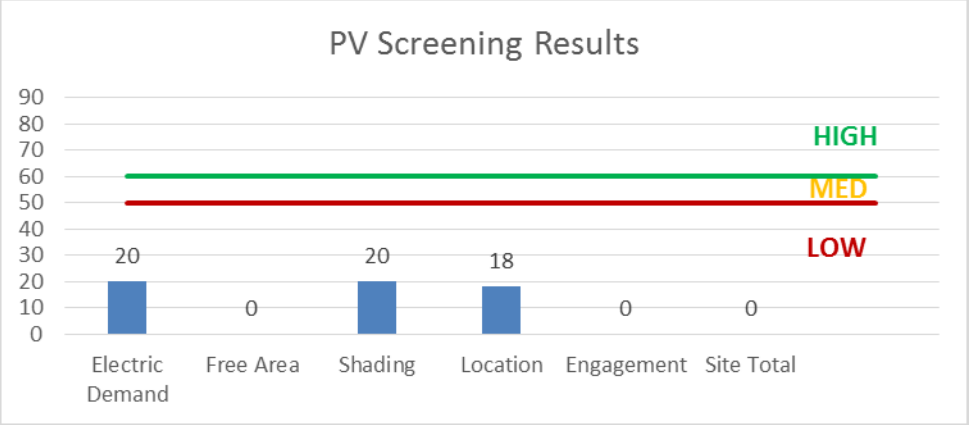
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area (direction of the pitched roof), and shading elements shows that the facility has a Low potential for installing a PV array.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 20 - Photovoltaic Screening



Potential	None	
System Potential	43	kW DC STC
Electric Generation	51,229	kWh/yr
Displaced Cost	$4,460	/yr
Installed Cost	$111,800	

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 21 for a list of the eligible programs identified for each recommended ECM.

Figure 21 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Direct Install
ECM 1	Install LED Fixtures	x	x
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x	x
ECM 3	Retrofit Fixtures with LED Lamps	x	x
ECM 4	Install Occupancy Sensor Lighting Controls	x	x
ECM 5	Install Low-Flow Domestic Hot Water Devices		x

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when

developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gym	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,090	Relamp & Reballast	No	16	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,090	0.59	2,154	0.0	$257.73	$2,589.33	$320.00	8.81
Entrance hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	2,090	Relamp	No	1	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	2,090	0.06	214	0.0	$25.60	$134.22	$30.00	4.07
Main office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.26	952	0.0	$113.91	$601.60	$120.00	4.23
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,463	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.13	333	0.0	$39.87	$300.80	$60.00	6.04
Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,090	0.02	70	0.0	$8.34	$63.20	$0.00	7.58
Hallway	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.52	1,904	0.0	$227.82	$1,404.00	$240.00	5.11
Library	24	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	24	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	1.35	4,961	0.0	$593.70	$4,373.04	$0.00	7.37
Library	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	8	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	0.45	1,654	0.0	$197.90	$1,457.68	$0.00	7.37
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.16	601	0.0	$71.97	$467.00	$80.00	5.38
Tech room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.06	238	0.0	$28.48	$150.40	$30.00	4.23
Tech room	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,090	Fixture Replacement	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,090	0.02	76	0.0	$9.06	$62.52	$0.00	6.90
Tech room	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	92	2,090	Fixture Replacement	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	2,090	0.04	135	0.0	$16.11	$111.91	$0.00	6.95
Hallway	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	19	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.41	1,507	0.0	$180.35	$1,111.50	$190.00	5.11
Hallway	15	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,090	Relamp	No	15	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,090	0.16	577	0.0	$69.04	$723.00	$150.00	8.30
Room 15,16	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	24	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.78	2,855	0.0	$341.72	$1,804.80	$360.00	4.23
Room 20,21,18,17	44	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	44	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	1.80	6,615	0.0	$791.66	$4,388.80	$800.00	4.53
Room 20,21,18,17	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,090	0.06	209	0.0	$25.03	$189.60	$0.00	7.58
Room 20,21,18,17	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,090	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,090	0.03	115	0.0	$13.81	$144.60	$30.00	8.30
Music,23,22,21	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,463	Relamp	No	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	1.04	2,665	0.0	$318.94	$2,406.40	$480.00	6.04
Staff restroom	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,463	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,463	0.04	108	0.0	$12.89	$192.80	$40.00	11.86
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Boys' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Girls' restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	780	0.01	14	0.0	$1.72	$48.20	$10.00	22.24
Boys' restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	780	0.01	14	0.0	$1.72	$48.20	$10.00	22.24
Room 1	8	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.31	1,134	0.0	$135.77	$667.44	$0.00	4.92

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 1	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	8	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	0.45	1,654	0.0	$197.90	$1,457.68	$0.00	7.37
Nurse's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.09	317	0.0	$37.97	$234.00	$40.00	5.11
Hallway	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,090	0.06	209	0.0	$25.03	$189.60	$0.00	7.58
Room 2,3,4,5,6	40	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	Yes	40	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	1.78	6,509	0.0	$778.95	$4,687.20	$175.00	5.79
Room 2,3,4,5,6	40	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	40	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	2.25	8,268	0.0	$989.51	$7,288.40	$0.00	7.37
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.06	89	0.0	$10.63	$175.50	$30.00	13.69
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Entrance hallway	17	LED Screw-In Lamps: 1 lamp	Wall Switch	15	2,090	None	No	17	LED Screw-In Lamps: 1 lamp	Wall Switch	15	2,090	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	5	Compact Fluorescent: 1 lamp	Wall Switch	42	2,090	Relamp	No	5	LED Screw-In Lamps: 1 lamp	Wall Switch	7	2,090	0.11	421	0.0	$50.34	$268.77	$0.00	5.34
Main office	4	Compact Fluorescent: 1 lamp	Occupancy Sensor	26	1,463	Relamp	No	4	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	4	1,463	0.06	148	0.0	$17.72	$215.01	$0.00	12.13
Office	2	Incandescent: 1 lamp	Wall Switch	40	2,090	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	7	2,090	0.04	159	0.0	$18.98	$107.51	$10.00	5.14
Room 7,8	12	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.53	1,953	0.0	$233.68	$1,233.16	$40.00	5.11
Room 7,8	12	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	12	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	0.68	2,480	0.0	$296.85	$2,186.52	$0.00	7.37
Room 9,10,11,12,13,14	72	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	Yes	72	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	3.20	11,716	0.0	$1,402.11	$7,626.96	$210.00	5.29
Room 9,10,11,12,13,14	72	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	72	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	4.06	14,882	0.0	$1,781.11	$13,119.12	$0.00	7.37
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.06	89	0.0	$10.63	$175.50	$30.00	13.69
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Teacher's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,090	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,090	0.15	538	0.0	$64.43	$380.53	$80.00	4.66
Room 7,8	2	Incandescent: 1 lamp	Wall Switch	60	2,090	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	8	2,090	0.07	250	0.0	$29.92	$107.51	$10.00	3.26
Custodian closet	1	Incandescent: 1 lamp	Wall Switch	100	52	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	14	52	0.06	5	0.0	$0.62	$53.75	$5.00	79.21
Hallway	6	Incandescent: 1 lamp	Wall Switch	40	2,090	Relamp	No	6	LED Screw-In Lamps: 1 lamp	Wall Switch	7	2,090	0.13	476	0.0	$56.95	$322.52	$30.00	5.14
Exterior	3	Metal Halide: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	141	4,380	0.30	2,327	0.0	$278.50	$1,172.03	$300.00	3.13
Exterior	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	50	4,380	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	50	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	2	Compact Fluorescent: 1 lamp	Wall Switch	50	4,380	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	14	4,380	0.05	363	0.0	$43.40	$107.51	$0.00	2.48
All school	15	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	15	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Boiler	2	Heating Hot Water Pump	10.0	91.7%	Yes	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Boiler	2	Other	0.3	77.0%	Yes	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Air compressor	1	Air Compressor	1.0	77.0%	No	4,957	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	All school	7	Exhaust Fan	0.5	77.0%	No	4,380	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway heating	AHU	1	Supply Fan	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Unit heater	2	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms heat suply	20	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hilldale	Offices	1	Packaged AC	6.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hilldale	Offices	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hilldale	Classrooms	2	Split-System AC	2.50		Yes	2	Split-System AC	2.50		16.00		No	1.68	2,275	0.0	$272.27	$7,481.10	$460.00	25.79
Hilldale	Classrooms	6	Split-System AC	3.50		Yes	6	Split-System AC	3.50		16.00		No	7.04	9,555	0.0	$1,143.53	$31,420.62	$1,932.00	25.79
Hilldale	Room 1,2,3,4,5,6,9,10,11,12,13, 14	12	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hilldale	Gym, Room 7,8	7	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	All school	3	Condensing Hot Water Boiler	987.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Restrooms and classroom	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Custodian room	Restrooms and classroom	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Art room	Art room	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main office, CR 15,16,20,21,18,17	7	Faucet Aerator (Kitchen)	2.50	2.20	0.00	534	0.0	$63.92	$50.19	$0.00	0.79
Girls' restroom, Boys' restroom	12	Faucet Aerator (Lavatory)	2.20	1.00	0.00	3,663	0.0	$438.33	$86.04	$0.00	0.20

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teachers lounge	1	Electric Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Hilldale elementary school	76	Computer	150.0	Yes
Hilldale elementary school	23	Laptop	45.0	Yes
Hilldale elementary school	7	Printer small	20.0	Yes
Hilldale elementary school	7	Printer - Medium	60.0	Yes
Hilldale elementary school	3	Printer - Large	600.0	Yes
Hilldale elementary school	1	paper shredder	150.0	Yes
Hilldale elementary school	20	Projector	200.0	Yes
Hilldale elementary school	5	Microwave	1,000.0	No
Hilldale elementary school	2	Refrigerator - large	200.0	No
Hilldale elementary school	2	Coffee machine	900.0	Yes
Hilldale elementary school	16	CRT - television	120.0	No
Hilldale elementary school	1	LED - TV	100.0	Yes
Hilldale elementary school	2	Space Heater	1,500.0	No
Hilldale elementary school	1	Water dispenser	500.0	Yes
Hilldale elementary school	4	Standing fan	100.0	No
Hilldale elementary school	9	Chrome book cart	40.0	Yes
Hilldale elementary school	16	Smart Board	5.0	Yes

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

80

ENERGY STAR® Score[1]

Hilldale Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 37,055
Built: 1974

For Year Ending: January 31, 2016
Date Generated: August 22, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Hilldale Elementary School 123 Konner Avenue Pine Brook, New Jersey 07058	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5944583

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
50.7 kBtu/ft²

Source EUI
117.6 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	736,929 (39%)
Electric - Grid (kBtu)	1,141,050 (61%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	68
National Median Source EUI (kBtu/ft²)	157.6
% Diff from National Median Source EUI	-25%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	166

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

Local Government Energy Audit:
Energy Audit Report

Valley View Elementary School

30 Montgomery Avenue

Montville, NJ 07045

Montville Township BOE

September 20, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Valley View Elementary School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Valley View Elementary School is a 54,725 square foot two story facility comprised of various space types such as the classrooms, library, cafeteria, offices, restrooms and mechanical room. The school serves students from Pre-K through fifth grades. This is a 10 month school. On a regular day, the school is scheduled to function from 7AM-3PM for the teachers and students. The school remains open for a few hours more for after school activities.

The building is heated using two gas fired condensing hot water boilers and the space cooling (DX) is provided using a combination of split AC units and packaged roof top units. Lighting in the building predominantly consists of T8 linear tubes and some smaller spaces lit using T12 linear tubes and compact fluorescent bulbs.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 6 measures which together represent an opportunity for Valley View Elementary School to reduce annual energy costs by roughly $20,082 and annual greenhouse gas emissions by 173,766 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 7.7 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Valley View Elementary School's annual energy use by 16%.

Figure 1 – Previous 12 Month Utility Costs

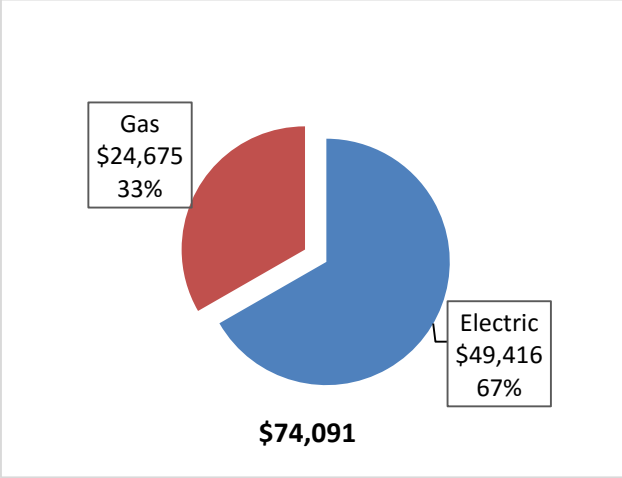
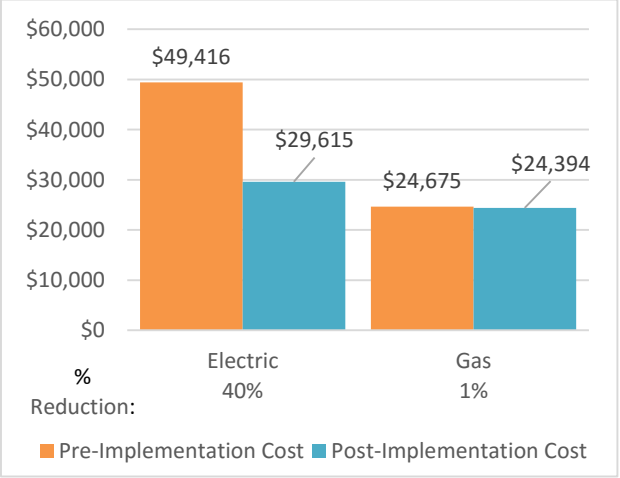


Figure 2 – Potential Post-Implementation Costs



A detailed description of Valley View Elementary School's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**96,492**	**23.7**	**0.0**	**$11,267.14**	**$61,189.82**	**$10,815.00**	**$50,374.82**	**4.5**	**97,167**
ECM 1	Install LED Fixtures	Yes	14,829	1.9	0.0	$1,731.53	$8,419.77	$1,640.00	$6,779.77	3.9	14,933
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	905	0.3	0.0	$105.63	$759.51	$0.00	$759.51	7.2	911
ECM 3	Retrofit Fixtures with LED Lamps	Yes	80,759	21.5	0.0	$9,429.98	$52,010.54	$9,175.00	$42,835.54	4.5	81,324
Lighting Control Measures			**11,967**	**3.2**	**0.0**	**$1,397.35**	**$6,332.00**	**$930.00**	**$5,402.00**	**3.9**	**12,051**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	11,967	3.2	0.0	$1,397.35	$6,332.00	$930.00	$5,402.00	3.9	12,051
Variable Frequency Drive (VFD) Measures			**26,958**	**3.0**	**0.0**	**$3,147.78**	**$18,493.82**	**$0.00**	**$18,493.82**	**5.9**	**27,146**
ECM 5	Install VFDs on Hot Water Pumps	Yes	26,958	3.0	0.0	$3,147.78	$18,493.82	$0.00	$18,493.82	5.9	27,146
Electric Unitary HVAC Measures			**23,792**	**14.1**	**0.0**	**$2,778.14**	**$83,206.27**	**$4,126.00**	**$79,080.27**	**28.5**	**23,959**
	Install High Efficiency Electric AC	No	23,792	14.1	0.0	$2,778.14	$83,206.27	$4,126.00	$79,080.27	28.5	23,959
HVAC System Improvements			**10,369**	**2.3**	**0.0**	**$1,210.73**	**$1,800.00**	**$500.00**	**$1,300.00**	**1.1**	**10,441**
ECM 6	Install Dual Enthalpy Outside Economizer Control	Yes	10,369	2.3	0.0	$1,210.73	$1,800.00	$500.00	$1,300.00	1.1	10,441
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	25.6	$280.53	$179.25	$0.00	$179.25	0.6	3,002
TOTAL OF ALL EVALUATED ECMS			**169,578**	**46.3**	**25.6**	**$20,081.67**	**$171,201.16**	**$16,371.00**	**$154,830.16**	**7.7**	**173,766**
TOTAL OF ALL RECOMMENDED ECMS			**135,417**	**30**	**0**	**15,812**	**86,016**	**11,745**	**74,271**	**4.7**	**136,364**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Energy Efficient Practices

TRC Energy Services also identified 9 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Valley View Elementary School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Valley View Elementary School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. For details on our evaluation and on-site generation potential, please refer to section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent of Schools	rene.rovtar@montville.net	973-331-7100 Extn: 2228
Steven Toth	Facilities Manager	steven.toth@montville.net	973-331-7100 Extn: 2236
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 08, 2017, TRC Energy Services performed an energy audit at Valley View Elementary School located in Montville, NJ. TRC Energy Services' team met with Ted Keane to review the facility operations and help focus our investigation on specific energy-using systems.

Valley View Elementary School is a 54,725 square foot two story facility comprised of various space types such as the classrooms, library, cafeteria, offices, restrooms and mechanical room. The school serves students from Pre-K through fifth grades. This is a 10 month school. On a regular day, the school is scheduled to function from 7AM-3PM for the teachers and students. The school remains open for a few hours more for after school activities.

The building was originally constructed in 1973. There were several renovations since then and an addition in the year 2000. The addition includes the cafeteria and few classrooms. Space heating is provided via two gas fired condensing hot water boilers and the space cooling (DX) is provided using a combination of split AC units and packaged roof top units. Lighting in the building predominantly consists of T8 linear tubes and some smaller spaces lit using T12 linear tubes and compact fluorescent bulbs.

2.3 Building Occupancy

The typical schedule is presented in the table below. The facility functions at maximum capacity between 7AM and 3PM and remains open until 6PM for several after school activities. During a typical day, the facility is occupied by approximately 70 full time staff (including teachers, admin and maintenance) and 420 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Valleyview Elementary School	Weekday	7AM - 3PM
Valleyview Elementary School	Weekend	No operation

2.4 Building Envelope

The building is constructed of concrete block, and brick masonry. The dividing walls in most spaces are sinter blocks. The building (original section and addition) has a flat roof with asphalt layer covering the

original section and EPDM rubber membrane covering the newer section. The building has double pane windows and aluminum doors. The roofs, windows and doors were observed to be in good condition.

Image 1 Building envelope images showing the facade and the building roof

2.5 On-Site Generation

Valley View Elementary School does not have any on-site electric generation system currently installed.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL, 42-watt). A few spaces are still lit using T12 linear tubes with magnetic ballasts. The gymnasium is lit using high bay T5 linear tubes and a few other spaces using U-bent T8 fixtures. Most of the fixtures are 4-foot with 1-lamp, 2-lamp, 3-lamp or 4-lamp long troffers.

Lighting control in most spaces is provided by manual wall switches except the teachers' restroom, a couple of conference rooms and storage closets. These spaces have wall mounted occupancy sensors to control the lighting in the spaces.

The building's exterior lighting is has 100-watt and 250-watt metal halide wall pack fixtures and 30-watt LED fixtures in the poles. These exterior fixtures are controlled using timers and hours of operation depends on the season. All EXIT signs in the school are 2-watt LED fixtures.

Image 2 Typical lighting fixtures found at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Hot Water (or Steam) Heating System

The hot water system consists of two gas fired condensing hot water boilers from MACH with an output capacity of 2850 MBh. The hot water is circulated using six constant speed pumps with capacities (2) 1.5hp, (2) 3hp and (2) 7.5 hp. The motors are 12 years old and in decent condition. Hot water is supplied at 180°F when the outside air temperature is below 50°F and the water temperature is modulated according to the increase in the OAT until the outside air is above 65°F. Above this temperature the boilers are shut down. The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather. The boilers are new, well maintained and in good condition.

The terminal units distributing heat in the building are unit ventilators (with 1/4hp fan capacity each). These are from different periods in the original section and the newer section of the building. These (AAF units) are old, inaccurate and are and the heating demand is through pneumatic controls. When the temperature is less than the set point of the space, the hot water valve opens to let the boiler waters circulate through the coil. The supply fan then blows the heated air into the space. Once the temperature reaches the set point the valve is closes. The newer section unit ventilators are coupled with hot water coils and DX cooling coils with condensers on the roof. These appeared to be in good condition. In addition to this, the rooftop packaged units are equipped with hot water coils and distribute heat in the zones controlled by them using ceiling ducts.

Image 3 Boilers and terminal units found at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Direct Expansion Air Conditioning System (DX)

There are two packaged AC units from McQuay (20 tons) that have hot water and DX cooling coils that serve the media center and few classrooms. These are 20 years old and recommended for replacement. The main office is served by a 7.5 ton Lennox packaged unit and a 15 ton Trane unit serves the all-purpose room/gym. These units also have hot water coils in them served by the boiler. The classrooms in the older sections have split AC units from Fujitsu (2.5 or 3 tons) serving them while the classrooms in the new addition have DX cooling coils (3.5 tons) in their respective unit ventilators (with condensers on the roof top) conditioning the space.

All these units are controlled using individual thermostats in their respective zones.

Image 4 Typical cooling equipment at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one gas fired hot water heater from AO Smith. The unit has an input capacity of 199 MBh and a tank capacity of 100 gallons serving all restrooms and sinks in the school. The water heater is a high efficiency unit, two years old, in good condition and well maintained.

Image 5 Domestic hot water heater at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Building Plug Load

There are roughly 100 computer work stations and 20 laptops throughout the facility. The students also carry chrome books with them which are charged using the chrome book carts while at school. Each of these classrooms have projectors and smart boards that run throughout the normal functioning hours of the school. Roughly 90% of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

Other plug loads include printers and refrigerators of various sizes, televisions, space heaters etc.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush. The school does not have locker rooms or team rooms. It is recommended that the fixtures that are not low flow be changed so that the demand on the domestic hot water heater is reduced.

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3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

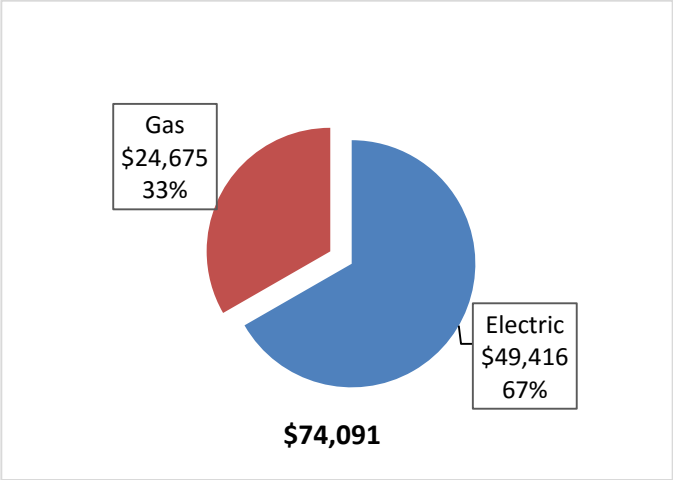
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Valley View Elementary School		
Fuel	**Usage**	**Cost**
Electricity	423,201 kWh	$49,416
Natural Gas	22,552 Therms	$24,675
Total		**$74,091**

The current annual energy cost for this facility is $74,091 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.117/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Sol. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

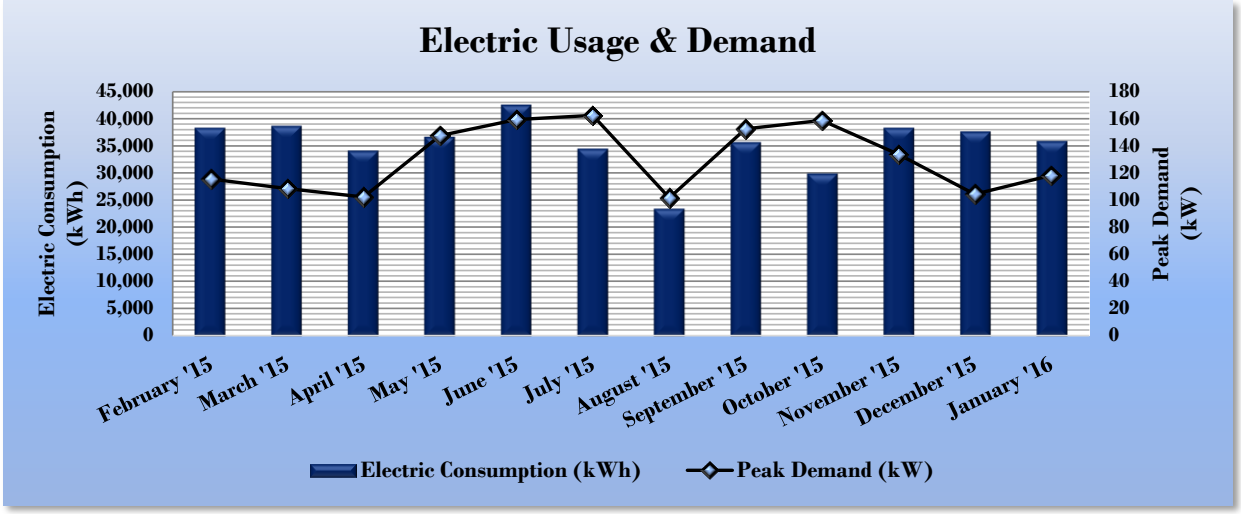


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Valley View Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/17/15	30	38,320	115	$682	$4,417
3/20/15	31	38,640	108	$637	$4,213
4/17/15	28	34,080	102	$557	$3,930
5/18/15	31	36,640	148	$771	$4,418
6/19/15	32	42,560	159	$897	$5,119
7/20/15	31	34,480	163	$917	$4,348
8/18/15	29	23,440	102	$551	$2,069
9/18/15	31	35,680	153	$857	$4,406
10/20/15	32	29,920	159	$834	$3,819
11/24/15	35	38,320	134	$694	$4,505
12/23/15	29	37,600	104	$528	$4,269
1/20/16	28	35,840	118	$606	$4,175
Totals	**367**	**425,520**	**162.6**	**$8,532**	**$49,687**
Annual	**365**	**423,201**	**162.6**	**$8,485**	**$49,416**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.094/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

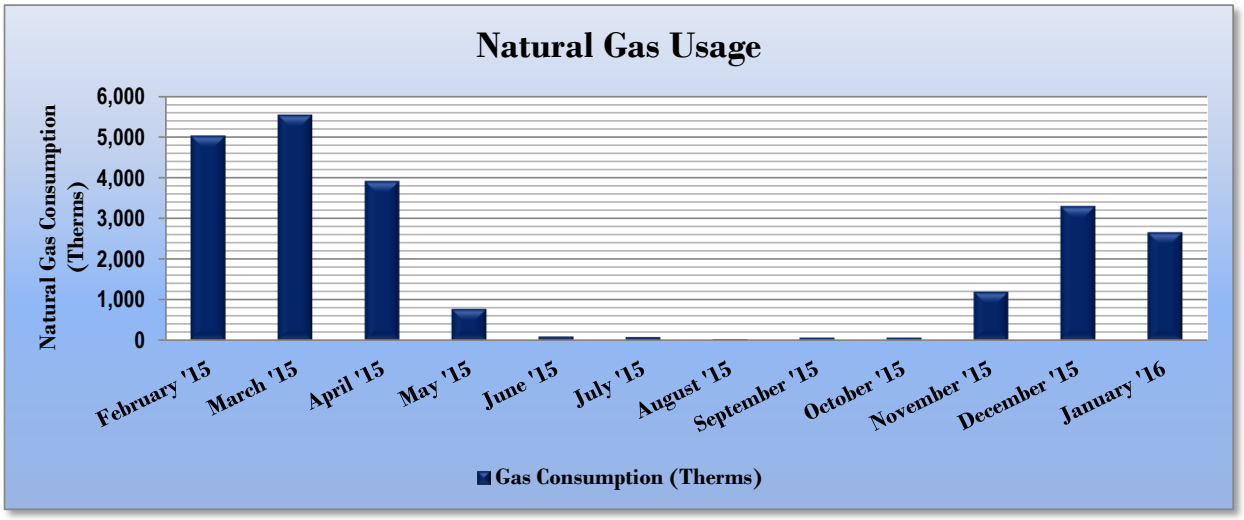


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Valley View Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/17/15	30	5,014	$4,785
3/20/15	31	5,526	$5,272
4/17/15	28	3,903	$3,716
5/18/15	31	772	$1,123
6/19/15	32	90	$557
7/20/15	31	81	$549
8/18/15	29	23	$503
9/18/15	31	65	$536
10/20/15	32	64	$535
11/24/15	35	1,194	$1,424
12/23/15	29	3,293	$3,210
1/20/16	28	2,651	$2,601
Totals	**367**	**22,676**	**$24,810**
Annual	**365**	**22,552**	**$24,675**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Valley View Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	126.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	67.6	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Valley View Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	99.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	58.7	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 63.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

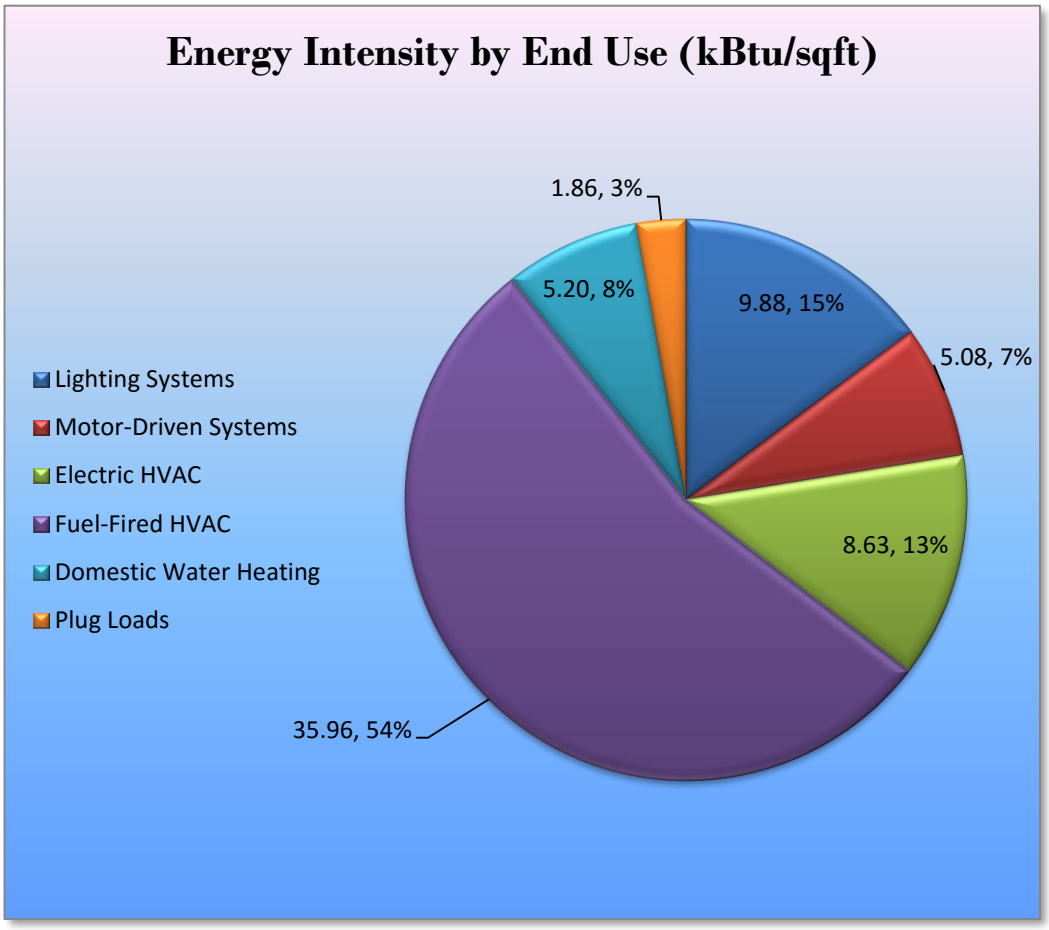
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (kBtu/SF, %)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Valley View Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**96,492**	**23.7**	**0.0**	**$11,267.14**	**$61,189.82**	**$10,815.00**	**$50,374.82**	**4.5**	**97,167**
ECM 1	Install LED Fixtures	14,829	1.9	0.0	$1,731.53	$8,419.77	$1,640.00	$6,779.77	3.9	14,933
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	905	0.3	0.0	$105.63	$759.51	$0.00	$759.51	7.2	911
ECM 3	Retrofit Fixtures with LED Lamps	80,759	21.5	0.0	$9,429.98	$52,010.54	$9,175.00	$42,835.54	4.5	81,324
Lighting Control Measures		**11,967**	**3.2**	**0.0**	**$1,397.35**	**$6,332.00**	**$930.00**	**$5,402.00**	**3.9**	**12,051**
ECM 4	Install Occupancy Sensor Lighting Controls	11,967	3.2	0.0	$1,397.35	$6,332.00	$930.00	$5,402.00	3.9	12,051
Variable Frequency Drive (VFD) Measures		**26,958**	**3.0**	**0.0**	**$3,147.78**	**$18,493.82**	**$0.00**	**$18,493.82**	**5.9**	**27,146**
ECM 5	Install VFDs on Hot Water Pumps	26,958	3.0	0.0	$3,147.78	$18,493.82	$0.00	$18,493.82	5.9	27,146
Electric Unitary HVAC Measures		**23,792**	**14.1**	**0.0**	**$2,778.14**	**$83,206.27**	**$4,126.00**	**$79,080.27**	**28.5**	**23,959**
	Install High Efficiency Electric AC	23,792	14.1	0.0	$2,778.14	$83,206.27	$4,126.00	$79,080.27	28.5	23,959
HVAC System Improvements		**10,369**	**2.3**	**0.0**	**$1,210.73**	**$1,800.00**	**$500.00**	**$1,300.00**	**1.1**	**10,441**
ECM 6	Install Dual Enthalpy Outside Economizer Control	10,369	2.3	0.0	$1,210.73	$1,800.00	$500.00	$1,300.00	1.1	10,441
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	25.6	$280.53	$179.25	$0.00	$179.25	0.6	3,002
TOTAL OF ALL RECOMMENDED ECMS		**135,417**	**30**	**0**	**15,812**	**86,016**	**11,745**	**74,271**	**4.7**	**136,364**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**96,492**	**23.7**	**0.0**	**$11,267.14**	**$61,189.82**	**$10,815.00**	**$50,374.82**	**4.5**	**97,167**
ECM 1	Install LED Fixtures	14,829	1.9	0.0	$1,731.53	$8,419.77	$1,640.00	$6,779.77	3.9	14,933
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	905	0.3	0.0	$105.63	$759.51	$0.00	$759.51	7.2	911
ECM 3	Retrofit Fixtures with LED Lamps	80,759	21.5	0.0	$9,429.98	$52,010.54	$9,175.00	$42,835.54	4.5	81,324

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	14,829	1.9	0.0	$1,731.53	$8,419.77	$1,640.00	$6,779.77	3.9	14,933

Measure Description

We recommend replacing existing exterior fixtures containing HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	905	0.3	0.0	$105.63	$759.51	$0.00	$759.51	7.2	911
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures (with magnetic ballasts) by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	80,759	21.5	0.0	$9,429.98	$52,010.54	$9,175.00	$42,835.54	4.5	81,324
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing compact fluorescent and incandescent lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**11,967**	**3.2**	**0.0**	**$1,397.35**	**$6,332.00**	**$930.00**	**$5,402.00**	**3.9**	**12,051**
ECM 4	Install Occupancy Sensor Lighting Controls	11,967	3.2	0.0	$1,397.35	$6,332.00	$930.00	$5,402.00	3.9	12,051

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
11,967	3.2	0.0	$1,397.35	$6,332.00	$930.00	$5,402.00	3.9	12,051

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in restrooms, storage rooms, classrooms and offices areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**26,958**	**3.0**	**0.0**	**$3,147.78**	**$18,493.82**	**$0.00**	**$18,493.82**	**5.9**	**27,146**
ECM 5	Install VFDs on Hot Water Pumps	26,958	3.0	0.0	$3,147.78	$18,493.82	$0.00	$18,493.82	5.9	27,146

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about current motors systems and VFD recommendations.

ECM 5: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
26,958	3.0	0.0	$3,147.78	$18,493.82	$0.00	$18,493.82	5.9	27,146

Measure Description

We recommend installing a variable frequency drives (VFD) to control all 6 hot water ((2)1.5hp, (2)3hp, (2)7.5hp) pumps circulating the boiler water. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 HVAC System Improvements

ECM 6: Install Dual-Enthalpy Economizers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,369	2.3	0.0	$1,210.73	$1,800.00	$500.00	$1,300.00	1.1	10,441

Measure Description

Dual enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. We suggest that the facility installs enthalpy economizers to the AC1 and AC2 units to the existing systems. These units have been evaluated for replacements. In that case we recommend that the facility chooses a unit with economizer option. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the

lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy.

Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 19 below.

Figure 19 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**25.6**	**$280.53**	**$179.25**	**$0.00**	**$179.25**	**0.6**	**3,002**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	25.6	$280.53	$179.25	$0.00	$179.25	0.6	3,002

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 6: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	25.6	$280.53	$179.25	$0.00	$179.25	0.6	3,002

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 20 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**23,792**	**14.1**	**0.0**	**$2,778.14**	**$83,206.27**	**$4,126.00**	**$79,080.27**	**28.5**	**23,959**
Install High Efficiency Electric AC	23,792	14.1	0.0	$2,778.14	$83,206.27	$4,126.00	$79,080.27	28.5	23,959
TOTAL OF ALL EVALUATED ECMS	**169,578**	**46.3**	**25.6**	**$20,081.67**	**$171,201.16**	**$16,371.00**	**$154,830.16**	**7.7**	**173,766**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
23,792	14.1	0.0	$2,778.14	$83,206.27	$4,126.00	$79,080.27	28.5	23,959

Measure Description

We evaluated replacing standard efficiency packaged air conditioning units (AC1 and AC2) with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

Although the two 20 ton (McQuay) packaged AC units serving the media center and the classrooms are old, the simple pay back on replacing these units are higher than the useful life time of the units themselves. The payback is about 28.5 years when these are evaluated as a single measure. However, when this unit is replaced along with the other recommended measures, the overall pay back is only about 7.7 years. The newer packaged units also have enthalpy economizers inbuilt on them and hence installing this as an individual measure can be neglected.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

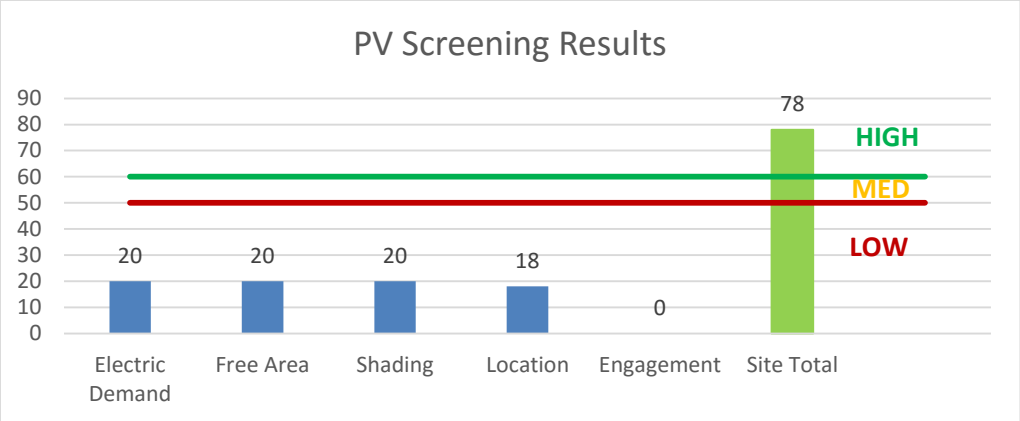
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **High** potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the building may be feasible. If Valley View Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 21 - Photovoltaic Screening



Potential	High	
System Potential	110	kW DC STC
Electric Generation	131,051	kWh/yr
Displaced Cost	$11,400	/yr
Installed Cost	$286,000	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use

the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x
ECM 3	Retrofit Fixtures with LED Lamps	x		x
ECM 4	Install Occupancy Sensor Lighting Controls	x		x
ECM 5	Install VFDs on Hot Water Pumps		x	x
ECM 6	Install Dual Enthalpy Outside Economizer Control	x		x
ECM 7	Install Low-Flow Domestic Hot Water Devices			x

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.26	984	0.0	$114.86	$601.60	$120.00	4.19
Main office	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85
Principal's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.16	621	0.0	$72.57	$416.80	$80.00	4.64
Lounge	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.10	369	0.0	$43.07	$225.60	$45.00	4.19
Main entrance	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.19	738	0.0	$86.14	$451.20	$90.00	4.19
Main entrance	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.06	246	0.0	$28.71	$175.50	$30.00	5.07
Gym	8	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	2,160	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,160	0.33	1,232	0.0	$143.86	$761.07	$160.00	4.18
Elevator machine room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.02	82	0.0	$9.57	$58.50	$10.00	5.07
Elevator machine room	3	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	2,160	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,160	0.12	462	0.0	$53.95	$285.40	$60.00	4.18
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.19	738	0.0	$86.14	$526.50	$90.00	5.07
Cafeteria	35	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	35	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	1.14	4,304	0.0	$502.51	$2,632.00	$525.00	4.19
CR 16	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.45	1,709	0.0	$199.57	$943.20	$185.00	3.80
CR 16	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85
CR 17	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.45	1,709	0.0	$199.57	$943.20	$185.00	3.80
CR 17	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85
CR 18	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.45	1,709	0.0	$199.57	$943.20	$185.00	3.80
CR 18	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85
Side entrance	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.03	123	0.0	$14.36	$75.20	$15.00	4.19
Stairwell	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.04	332	0.0	$38.82	$117.00	$20.00	2.50
AHU room	3	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,160	Fixture Replacement	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,160	0.06	235	0.0	$27.41	$205.44	$0.00	7.50
AHU room	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,160	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,160	0.03	130	0.0	$15.23	$107.70	$15.00	6.09
Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.35	1,312	0.0	$153.15	$936.00	$160.00	5.07
Hallway	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,160	Fixture Replacement	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.08	293	0.0	$34.23	$166.86	$0.00	4.88
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.02	20	0.0	$2.30	$58.50	$10.00	21.05
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.02	82	0.0	$9.57	$58.50	$10.00	5.07

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 14	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.82	3,107	0.0	$362.85	$1,774.00	$335.00	3.97
CR 14	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.04	137	0.0	$15.95	$123.40	$30.00	5.85
CR 12	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.53	2,020	0.0	$235.85	$1,247.60	$230.00	4.31
CR 12	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.07	273	0.0	$31.91	$246.80	$60.00	5.85
CR 12	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,160	Fixture Replacement	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.04	147	0.0	$17.11	$83.43	$0.00	4.88
CR 15	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.70	2,641	0.0	$308.42	$1,548.40	$290.00	4.08
CR 15	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.07	273	0.0	$31.91	$246.80	$60.00	5.85
CR 13	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.57	2,175	0.0	$254.00	$1,322.80	$245.00	4.24
CR 13	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.07	273	0.0	$31.91	$246.80	$60.00	5.85
Teacher's restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	780	0.01	12	0.0	$1.41	$31.90	$5.00	19.02
Girl's restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.08	112	0.0	$13.10	$445.50	$65.00	29.04
Girl's restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	Relamp	No	3	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	780	0.03	36	0.0	$4.24	$95.70	$15.00	19.02
Boy's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.05	75	0.0	$8.74	$387.00	$55.00	38.01
Boy's restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	Relamp	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	780	0.02	24	0.0	$2.83	$63.80	$10.00	19.02
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.06	246	0.0	$28.71	$175.50	$30.00	5.07
Hallway	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.05	205	0.0	$23.93	$185.10	$45.00	5.85
CR 10	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,172.40	$215.00	4.40
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.06	246	0.0	$28.71	$175.50	$30.00	5.07
Hallway	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,160	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,160	0.03	119	0.0	$13.92	$144.60	$30.00	8.23
CR 10 B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.04	164	0.0	$19.14	$117.00	$20.00	5.07
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.06	499	0.0	$58.23	$175.50	$30.00	2.50
Electrical Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	52	Fixture Replacement	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.04	4	0.0	$0.41	$83.43	$0.00	202.51
CR 7B	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,512	0.71	2,709	0.0	$316.30	$1,147.50	$185.00	3.04
CR 7B	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.13	492	0.0	$57.43	$351.00	$60.00	5.07
Hallway	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.05	205	0.0	$23.93	$185.10	$45.00	5.85
CR 9B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,172.40	$215.00	4.40
CR 9A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,172.40	$215.00	4.40
CR 7C	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.57	2,175	0.0	$254.00	$1,322.80	$245.00	4.24
CR 7C	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.04	137	0.0	$15.95	$123.40	$30.00	5.85
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.13	492	0.0	$57.43	$351.00	$60.00	5.07
Hallway	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.05	205	0.0	$23.93	$185.10	$45.00	5.85
CR 8B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,172.40	$215.00	4.40
CR 8	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,172.40	$215.00	4.40
CR 7D	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.57	2,175	0.0	$254.00	$1,322.80	$245.00	4.24
CR 7D	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.04	137	0.0	$15.95	$123.40	$30.00	5.85
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.06	499	0.0	$58.23	$175.50	$30.00	2.50
Electrical Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,160	Fixture Replacement	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,160	0.02	78	0.0	$9.14	$68.46	$0.00	7.49
Storage closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	52	Fixture Replacement	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	52	0.02	2	0.0	$0.22	$68.46	$0.00	311.25
Gym	15	Incandescent: Recessed fixture - 1 lamp	Wall Switch	40	2,160	Relamp	No	15	LED Screw-In Lamps: Recesed fixture - 1 lamp	Wall Switch	8	2,160	0.31	1,192	0.0	$139.22	$806.30	$75.00	5.25
Main entrance	8	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	42	2,160	Relamp	No	8	LED Screw-In Lamps: Recesed fixture - 1 lamp	Wall Switch	8	2,160	0.18	676	0.0	$78.89	$430.02	$0.00	5.45
Main entrance	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator machine room	1	Exit Signs: LED - 2 W Lamp	None	6	520	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	520	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 16	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 17	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 18	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 11A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.13	492	0.0	$57.43	$351.00	$60.00	5.07
Hallway	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.05	205	0.0	$23.93	$185.10	$45.00	5.85
CR 11B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Roof access	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,512	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,512	0.02	57	0.0	$6.70	$58.50	$10.00	7.24
Library entrance	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.58	2,213	0.0	$258.43	$1,353.60	$270.00	4.19
Library entrance	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.52	1,967	0.0	$229.72	$1,404.00	$240.00	5.07
Library entrance	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	5	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,160	0.10	360	0.0	$42.06	$316.00	$0.00	7.51
Boiler room	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,160	Relamp	No	14	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,160	0.16	609	0.0	$71.06	$502.60	$70.00	6.09
Conference room A	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,512	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.06	172	0.0	$20.10	$150.40	$30.00	5.99
PE Room 1B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Room 1 A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Speech room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,512	0.08	311	0.0	$36.29	$291.50	$50.00	6.66
Speech room	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85
Media center office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.06	246	0.0	$28.71	$175.50	$30.00	5.07
CR 4B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
CR 4A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.02	82	0.0	$9.57	$58.50	$10.00	5.07
CR 3B	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.53	2,020	0.0	$235.85	$1,093.60	$215.00	3.73
CR 3A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Conference room D	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.08	311	0.0	$36.29	$266.40	$50.00	5.96
Conference room D	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,160	0.02	72	0.0	$8.41	$63.20	$0.00	7.51
Conference room C	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,512	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.10	258	0.0	$30.15	$225.60	$45.00	5.99
Conference room C	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,160	0.02	72	0.0	$8.41	$63.20	$0.00	7.51
CR 2B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 2A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.49	1,864	0.0	$217.71	$1,018.40	$200.00	3.76
Conference room B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.08	311	0.0	$36.29	$266.40	$50.00	5.96
Conference room B	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,160	0.02	72	0.0	$8.41	$63.20	$0.00	7.51
IT closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.13	492	0.0	$57.43	$300.80	$60.00	4.19
IT closet	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.04	137	0.0	$15.95	$123.40	$30.00	5.85
Women's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.05	75	0.0	$8.74	$233.00	$40.00	22.09
Women's restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	780	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	780	0.05	74	0.0	$8.64	$185.10	$45.00	16.21
Men's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.05	75	0.0	$8.74	$233.00	$40.00	22.09
Men's restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	780	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	780	0.05	74	0.0	$8.64	$185.10	$45.00	16.21
Teacher's restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	780	0.02	26	0.0	$3.04	$63.20	$0.00	20.81
Teacher's restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	780	0.02	26	0.0	$3.04	$63.20	$0.00	20.81
Book room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.02	82	0.0	$9.57	$58.50	$10.00	5.07
Book room	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,160	Fixture Replacement	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.04	147	0.0	$17.11	$83.43	$0.00	4.88
Teacher's restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	780	0.02	26	0.0	$3.04	$63.20	$0.00	20.81
Copier room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.19	738	0.0	$86.14	$451.20	$90.00	4.19
CR 5	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.57	2,175	0.0	$254.00	$1,168.80	$230.00	3.70
CR 5	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,160	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,160	0.05	174	0.0	$20.30	$143.60	$20.00	6.09
CR 5	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,160	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,160	0.01	34	0.0	$3.92	$31.90	$5.00	6.87
CR 6	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,512	0.62	2,331	0.0	$272.14	$1,244.00	$245.00	3.67
CR 6	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.02	82	0.0	$9.57	$58.50	$10.00	5.07
CR 6	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,160	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,160	0.01	34	0.0	$3.92	$31.90	$5.00	6.87
Nurse's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,160	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,160	0.13	492	0.0	$57.43	$300.80	$60.00	4.19
Nurse's office	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,160	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,160	0.02	68	0.0	$7.98	$61.70	$15.00	5.85
Nurse's office	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,160	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,160	0.01	34	0.0	$3.92	$31.90	$5.00	6.87
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,160	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,160	0.26	984	0.0	$114.86	$702.00	$120.00	5.07

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Library entrance	69	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	42	2,160	Relamp	No	69	LED Screw-In Lamps: Recesed fixture - 1 lamp	Wall Switch	9	2,160	1.49	5,656	0.0	$660.44	$3,708.96	$0.00	5.62
Library entrance	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
PE Room 1B	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 1 A	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Speech room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 3A	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 2B	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 2A	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 5	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	20	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	30	4,380	None	No	20	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	30	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	7	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	30	4,380	None	No	7	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	30	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	8	Metal Halide: (1) 100W Lamp	Wall Switch	128	4,380	Fixture Replacement	No	8	LED - Fixtures: Downlight Recessed	Wall Switch	50	4,380	0.41	3,143	0.0	$367.01	$2,168.94	$40.00	5.80
Exterior	16	Metal Halide: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	16	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	150	4,380	1.52	11,686	0.0	$1,364.52	$6,250.83	$1,600.00	3.41

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Elevator machine room	Elevator machine	1	Other	25.0	91.7%	No	2,000	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage rooms	HVV and AHU	2	Supply Fan	1.0	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Boiler	2	Heating Hot Water Pump	1.5	89.5%	No	2,745	No	89.5%	Yes	2	0.38	2,986	0.0	$348.65	$5,264.92	$0.00	15.10
Boiler Room	Boiler	2	Heating Hot Water Pump	3.0	89.5%	No	2,745	No	89.5%	Yes	2	0.75	5,972	0.0	$697.30	$6,015.30	$0.00	8.63
Boiler Room	Boiler	2	Heating Hot Water Pump	7.5	91.7%	No	3,391	No	91.7%	Yes	2	1.84	18,000	0.0	$2,101.83	$7,213.60	$0.00	3.43
Classrooms	Unit ventillators	22	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Exhaust Fans	7	Exhaust Fan	0.5	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof top	CR 16, CR 17, CR 18	3	Split-System AC	3.50		Yes	3	Split-System AC	3.50		17.00		No	2.67	4,514	0.0	$527.06	$15,710.31	$966.00	27.97
Roof top	AC1	1	Packaged AC	20.00		Yes	1	Packaged AC	20.00		12.80		Yes	6.88	14,824	0.0	$1,730.91	$34,647.98	$1,830.00	18.96
Roof top	AC2	1	Packaged AC	20.00		Yes	1	Packaged AC	20.00		12.80		Yes	6.88	14,824	0.0	$1,730.91	$34,647.98	$1,830.00	18.96
Roof top	Main offices	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof top	All purpose room	1	Packaged AC	15.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof top	CR 4A	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof top	IT closet	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	CR 14,13,10,9B,8B,11A	6	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	CR 12,15,10B,9A,8	5	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Valley View Elementary School	2	Condensing Hot Water Boiler	2,850.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	All school	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lounge, CR 16, CR 17, CR 18, CR 15, Media center office, Nurse's office	8	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	2.7	$29.53	$57.36	$0.00	1.94
Teacher's restroom, Girl's restroom, Boy's restroom, Teacher's restroom, CR 5, CR 6, Nurse's office	17	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	22.9	$251.00	$121.89	$0.00	0.49

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Valleyview elementary school	101	Computer	75.0	Yes
Valleyview elementary school	15	Laptop	45.0	Yes
Valleyview elementary school	2	Printer - small	20.0	Yes
Valleyview elementary school	15	Printer - medium	30.0	Yes
Valleyview elementary school	4	Printer - large	45.0	Yes
Valleyview elementary school	26	Projector	200.0	Yes
Valleyview elementary school	1	Refrigerator - small	20.0	No
Valleyview elementary school	1	Refrigerator - large	100.0	No
Valleyview elementary school	21	Television - CRT	120.0	No
Valleyview elementary school	2	Television - LED	40.0	Yes
Valleyview elementary school	1	Space heater	1,500.0	No
Valleyview elementary school	4	Standing fan	60.0	No
Valleyview elementary school	24	Smart board	5.0	Yes

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Valleyview Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 54,725
Built: 1973

For Year Ending: January 31, 2016
Date Generated: August 23, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Valleyview Elementary School Montgomery Avenue Montville, New Jersey 07045	_____ , (___)___-_____	____ _____ , (___)___-_____ _____

Property ID: 5944605

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
67 kBtu/ft²

Source EUI
125.5 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	2,219,957 (61%)
Electric - Grid (kBtu)	1,444,736 (39%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	74.8
National Median Source EUI (kBtu/ft²)	140.2
% Diff from National Median Source EUI	-10%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	278

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

Local Government Energy Audit:
Energy Audit Report

Robert R. Lazar Middle School

Montville Township Public Schools

123 Changebridge Road

Montville, NJ 07045

October 13~~1~~, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Robert R. Lazar Middle School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Robert R. Lazar Middle School is a one-story building totaling 113,900 square foot and was constructed in 1953. The building has a flat roof and exterior walls are finished with brick masonry. Interior lighting consists primarily of a combination of linear T8 and T12 lamps and fixtures. Interior lighting control is provided by manual wall switches. Heating is provided by four condensing boilers and the cooling system consists of window units, split system air conditioners (ACs), heat pumps, and rooftop packaged units.

A thorough description of the facility and our observations are located in Section 2, "Facility Information and Existing Conditions".

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 12 measures which together represent an opportunity for Robert R. Lazar Middle School to reduce annual energy costs by roughly $44,772 and annual greenhouse gas emissions by 386,954 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 8.6 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Robert R. Lazar Middle School's annual energy use by 17%.

Figure 1 – Previous 12 Month Utility Costs

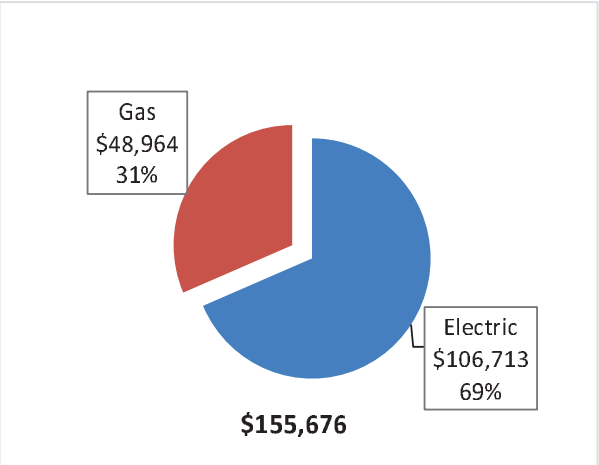
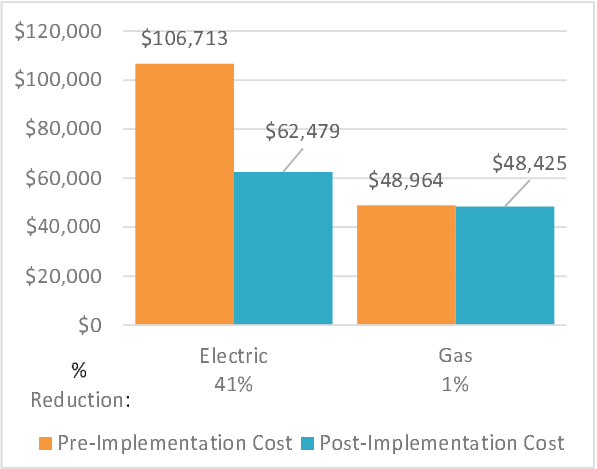


Figure 2 – Potential Post-Implementation Costs



A detailed description of Robert R. Lazar Middle School's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**164,251**	**48.5**	**0.0**	**$19,197.84**	**$138,869.35**	**$21,895.00**	**$116,974.35**	**6.1**	**165,400**
ECM 1	Install LED Fixtures	28,787	9.3	0.0	$3,364.60	$31,885.97	$3,940.00	$27,945.97	8.3	28,988
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	23,303	6.9	0.0	$2,723.63	$23,236.00	$2,100.00	$21,136.00	7.8	23,466
ECM 3	Retrofit Fixtures with LED Lamps	112,162	32.4	0.0	$13,109.61	$83,747.39	$15,855.00	$67,892.39	5.2	112,946
Lighting Control Measures		**32,666**	**9.4**	**0.0**	**$3,818.08**	**$17,628.00**	**$2,310.00**	**$15,318.00**	**4.0**	**32,895**
ECM 4	Install Occupancy Sensor Lighting Controls	29,607	8.6	0.0	$3,460.48	$16,584.00	$2,310.00	$14,274.00	4.1	29,814
ECM 5	Install High/Low Lighitng Controls	3,060	0.8	0.0	$357.60	$1,044.00	$0.00	$1,044.00	2.9	3,081
Variable Frequency Drive (VFD) Measures		**5,720**	**1.9**	**0.0**	**$668.58**	**$7,213.60**	**$0.00**	**$7,213.60**	**10.8**	**5,760**
ECM 6	Install VFDs on Hot Water Pumps	5,720	1.9	0.0	$668.58	$7,213.60	$0.00	$7,213.60	10.8	5,760
Electric Unitary HVAC Measures		**148,961**	**100.2**	**0.0**	**$17,410.67**	**$254,296.82**	**$13,733.00**	**$240,563.82**	**13.8**	**150,002**
ECM 7	Install High Efficiency Electric AC	148,961	100.2	0.0	$17,410.67	$254,296.82	$13,733.00	$240,563.82	13.8	150,002
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**14.6**	**$157.09**	**$2,265.73**	**$400.00**	**$1,865.73**	**11.9**	**1,709**
ECM 8	Install High Efficiency Furnaces	0	0.0	14.6	$157.09	$2,265.73	$400.00	$1,865.73	11.9	1,709
HVAC System Improvements		**20,061**	**4.5**	**0.0**	**$2,344.79**	**$5,300.00**	**$1,750.00**	**$3,550.00**	**1.5**	**20,202**
ECM 9	Install Dual Enthalpy Outside Economizer Control	20,061	4.5	0.0	$2,344.79	$5,300.00	$1,750.00	$3,550.00	1.5	20,202
Domestic Water Heating Upgrade		**0**	**0.0**	**35.4**	**$381.35**	**$222.27**	**$0.00**	**$222.27**	**0.6**	**4,149**
ECM 10	Install Low-Flow Domestic Hot Water Devices	0	0.0	35.4	$381.35	$222.27	$0.00	$222.27	0.6	4,149
Plug Load Equipment Control - Vending Machine		**6,790**	**0.0**	**0.0**	**$793.61**	**$1,150.00**	**$0.00**	**$1,150.00**	**1.4**	**6,837**
ECM 11	Vending Machine Control	6,790	0.0	0.0	$793.61	$1,150.00	$0.00	$1,150.00	1.4	6,837
TOTALS		**378,450**	**164.5**	**50.0**	**$44,772.00**	**$426,945.78**	**$40,088.00**	**$386,857.78**	**8.6**	**386,954**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC Energy Services also identified 17 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Robert R. Lazar Middle School include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Robert R. Lazar Middle School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	215	kW DC STC
Electric Generation	256,145	kWh/yr
Displaced Cost	$22,280	/yr
Installed Cost	$559,000	

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Pay for Performance - Existing Building (P4P)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as,

attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.5 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

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2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	Rene.Rovtar@montville.net	973-331-7100
Designated Representative			
Alex Santiago	Custodian		(201) 994-5384
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 08, 2017, TRC Energy Services performed an energy audit at Robert R. Lazar Middle School located in Montville, NJ. TRC Energy Services' team met with Alex Santiago to review the facility operations and help focus our investigation on specific energy-using systems.

The 113,900 square foot middle school building is a one-story facility and is comprised of classrooms, administrative offices, library, gymnasiums, locker rooms, cafeterias, kitchens, mechanical rooms, and storage areas. The building was constructed in 1953 with an addition in 2000. The building is primarily used as middle school program school and has students from grade 6 to 8.

2.3 Building Occupancy

The building typical hours of operation is presented in the table below. The school operates on a 10 month schedule and the gymnasium and library are used after hours for sports and other events during the weekdays and weekends.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Robert R. Lazart Middle School	Weekday	7:00 AM - 6:30 PM
Robert R. Lazart Middle School	Weekend	8:30 AM - 4:30 PM

2.4 Building Envelope

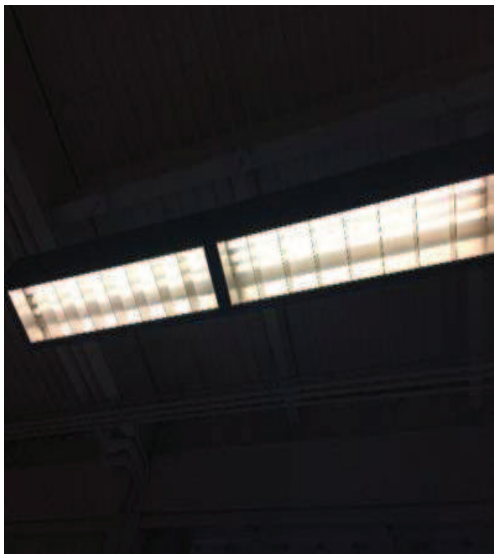
The foundation consists of cast-in-place concrete perimeter wall footings. Exterior walls are finished with brick masonry. The building has a flat roof covered with a multi-ply bituminous built-up membrane with a light stone covering. Majority of the HVAC equipment is installed on the roof. The roof is in fair condition. Typical windows throughout the facility are operable double pane with aluminum frames. Exterior doors are constructed of metal and are in good condition.

2.5 On-Site Generation

Montville Township Public School implemented a solar energy project in years ago. Robert R. Lazar Middle School was selected and has a 73.37 kW photovoltaic (PV) arrays installed on the roof which generated 81,823 kWh and represents about 8.9% of the facility annual electricity consumption. There still a lot of free space on the roof to extend the PV arrays installation.

2.6 Energy-Using Systems

Lighting System



Lighting at the facility is provided by a combination of linear fluorescent fixtures with 32 W T8 and 40 W T12 lamps with both electronic and magnetic ballasts. Most of the fixtures are 2-lamp or 4-lamp, 4-foot long troffers with diffusers. There are also a small number of compact fluorescent lamps (CFL), incandescent lamps, and metal halide lamps. The gymnasium is lit with both 32 W fluorescent T8 and 250 W metal halide lamps. The gymnasium's stage, the girl's locker room, classrooms 15 to 26 are all lit with 40 W fluorescent T12 lamps, and the remaining spaces are lit with 32 W fluorescent T8 lamps. Exit signs used throughout the building are LED lamps. Interior lighting control is provided mainly with manual wall switches. The building exterior lighting consists of mostly of 250 W metal halide are controlled with photocells.

Please see **Appendix A: Equipment Inventory & Recommendations**~~**Appendix A: Equipment Inventory &**~~ lighting equipment.

Hot Water Heating System

The hot water system consists of four condensing hot water boilers. Boiler room 1 houses two HARSCO boilers with an output capacity of 2,850 MBh each and a nominal combustion efficiency of 95%. They are eight years old and serve the 6th and 7th grade section of the building. There are two 3 hp and two 1.5 hp pumps that serve the heating hot water loop for these sections and are all located in the boiler room1. They are controlled by variable frequency drives (VFD). Boiler room 2 houses two AERCO boilers with an output capacity of 1,860 MBh each and a nominal combustion efficiency of 93%. They are five years old and serve the 8th grade section of the building. Heating hot water is circulated throughout these sections of the building via two 7.5 hp end suction constant speed pumps all located in the boiler room 2. The split system air conditioners and the boilers are controlled via a DDC building energy management system made by Honeywell.

The classrooms are all served by heating and ventilating units equipped with hot water coils for heating and DX coils for cooling. The units serving the old section of the building appear to be in poor condition and consist of vintage Nesbitt and AAF Nelsonaire models. The newer classrooms in the 8th grade section utilize ventilators made by Trane. The unit ventilators are coupled with 3.5 ton Trane split condensing units. The new unit ventilators are controlled by a Honeywell BEMS and each classroom is equipped with a thermostat with limited override capability.

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for an inventory of facility's heating equipment.

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Direct Expansion Air Conditioning System (DX)

The cooling system for the building consists of window units, split system ACs, heat pumps, and rooftop packaged units. The classrooms and other small offices are cooled with window units and split systems. The window units are sized from 1 to 2 ton and appear to be in good condition except two units. The split systems vary in size from 1.5 to 7.5 ton and are mostly 18 years old. The cafeteria and the kitchen are served by two 25 ton Trane rooftop packaged units. The units are constant air volume with a single 10 hp supply fan and 5 hp return fan. They are seven years old and appear in good condition. Various rooftop packaged units provide air conditioning to various spaces such as the main office, library, computer Lab, and gymnasium. The majority of the packaged rooftop units are constant volume units and have passed their defined ASHRAE useful life service.

The air is exhausted from the classrooms, hallways and corridors via dedicated exhaust fans located on the roof. The toilet rooms have dedicated roof exhausters as well. The kitchen includes a commercial exhaust hood, which provides exhaust for cooking equipment. A separate exhaust hood is interlocked with the dishwasher. The main kitchen hood is manually controlled with a wall switch.

Please see **Appendix A: Equipment Inventory & Recommendations**~~**Appendix A: Equipment Inventory &**~~ conditioning equipment.

Building Energy Management System (BEMS)

The new section unit ventilators, the split air conditioners and boilers are controlled via a DDC building energy management system (BEMS) made by Honeywell. The BMS provides control over the equipment and consists of scheduling, temperature sensors, equipment start stop controls, supply water temperature reset etc. Each classroom is equipped with a thermostat with limited override capability. The rooftop air conditioning units serving rooms 60 to 65 are controlled via a separate BEMS system made by TAC which can be accessed through a control panel in one of the utility closets within this section of the building. Some rooftop units are controlled via digital programmable thermostats. The unit ventilators in the original building are controlled via pneumatic control system.

Domestic Hot Water Heating System

Domestic hot water for the facility is provided by two natural gas fired non-condensing water heaters. One A.O. Smith hot water heater with an input rating of 150 MBh and has a 100 gallon storage tank and a nominal efficiency of 82%. The water heater is located in the boiler room 1 and serves the old section. It is two years old and appears in good condition. The second water heater is located in the electrical closet of the new section and has an input rating of 75 MBh, a nominal efficiency of 80% and has a 75 gallon storage tank. It is 10 years old and appears in good condition.

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for an inventory of the facility's domestic hot water equipment.

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Food Service & Refrigeration

The school houses institutional kitchen and cafeteria. The kitchens include gas ovens, five stand-up refrigerators, one walk-in cooler and walk-in medium temperature freezer. The kitchen is well maintained and the walk-in units appear to be in good condition.

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for an inventory of the facility's food service and laundry equipment.

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Building Plug Load

The building has approximately 193 computers with LCD monitors that are used daily, plus servers, 12 large photocopiers, and 15 printers. The computers, monitors, and printers seemed to be all recent models designed with power management software to reduce power when they sit idle for more than a few minutes.

The building has five vending machines located in the cafeteria and the teacher's room.

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for an inventory of the facility's plug load equipment.

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2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that all of the faucets are rated for 2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush. There are two restrooms with showers that bicycle commuters use in the morning. The showerheads are rated at 5 gpm.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

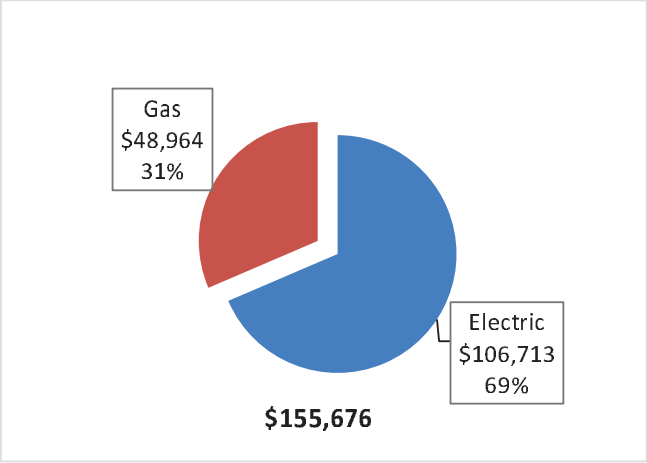
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Robert R. Lazar Middle School		
Fuel	**Usage**	**Cost**
Electricity	913,003 kWh	$106,713
Natural Gas	45,496 Therms	$48,964
Total		**$155,676**

The current annual energy cost for this facility is $155,676 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.117/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 9 - Graph of 12 Months Electric Usage & Demand

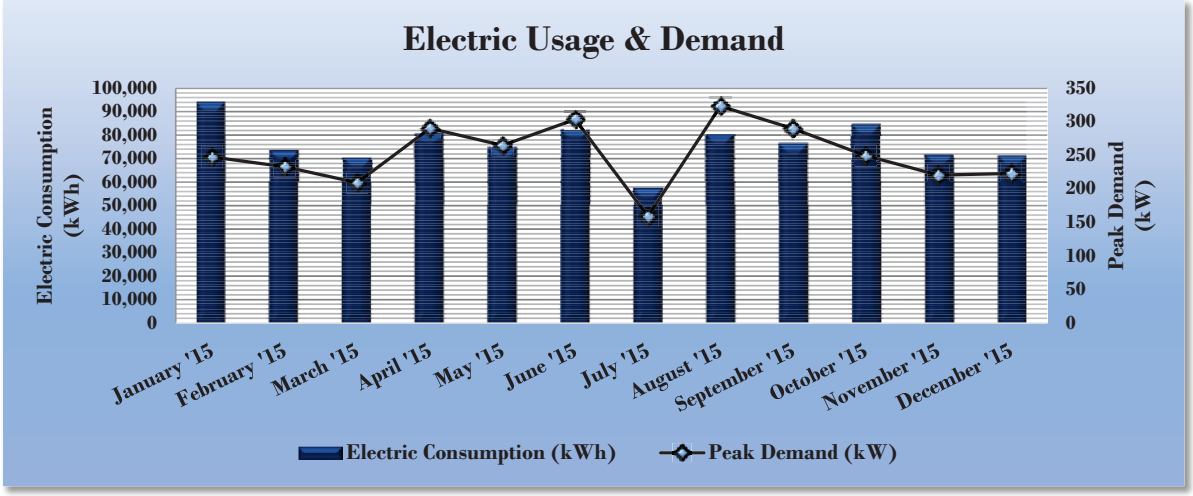


Figure 10 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Robert R. Lazar Middle School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/13/15	31	94,070	247	$440	$10,480
3/14/15	31	73,599	233	$398	$8,583
4/15/15	30	70,427	209	$182	$8,069
5/14/15	29	80,694	290	$310	$9,447
6/15/15	32	74,802	265	$281	$8,856
7/15/15	30	82,320	303	$321	$9,863
8/14/15	30	57,511	160	$204	$6,519
9/15/15	32	80,321	323	$304	$9,801
10/15/15	31	76,368	290	$294	$9,095
11/14/15	29	84,684	250	$334	$9,754
12/15/15	31	71,865	220	$286	$8,410
1/15/16	31	71,345	223	$291	$8,420
Totals	**367**	**918,006**	**323.1**	**$3,645**	**$107,297**
Annual	**365**	**913,003**	**323.1**	**$3,625**	**$106,713**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.076/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 11 - Graph of 12 Months Natural Gas Usage

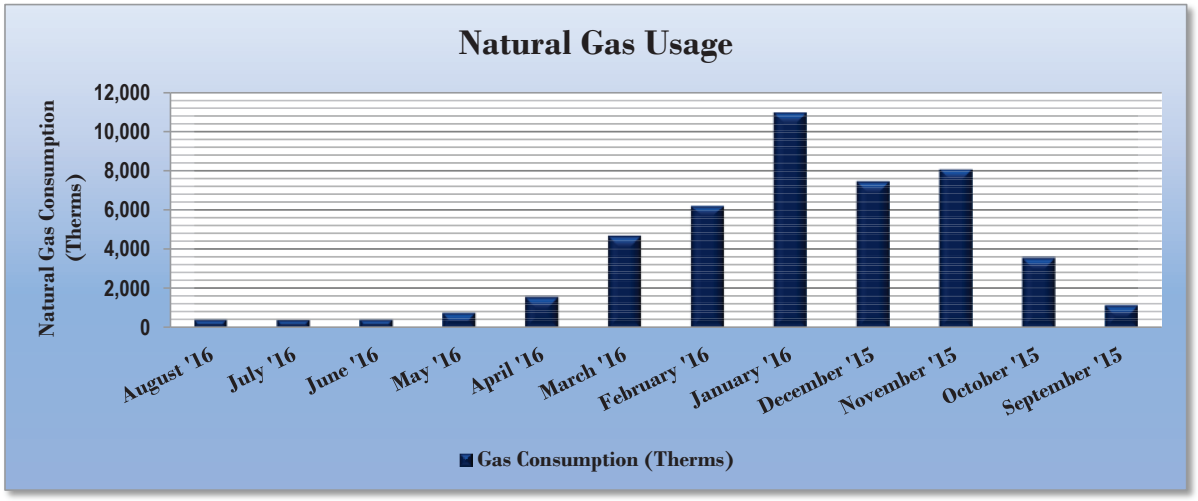


Figure 12 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Robert R. Lazar Middle School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
9/12/16	30	421	$1,302	Yes
8/12/16	30	411	$1,260	Yes
7/14/16	33	423	$1,343	Yes
6/13/16	30	752	$1,388	No
5/15/16	31	1,535	$2,384	No
4/14/16	33	4,705	$4,915	No
3/15/16	23	6,235	$5,905	No
2/14/16	35	10,955	$10,533	No
1/13/16	30	7,447	$7,105	No
12/15/15	31	8,068	$7,833	No
11/10/15	31	3,546	$3,950	No
10/9/15	29	1,122	$1,179	No
Totals	**366**	**45,621**	**$49,098**	3
Annual	**365**	**45,496**	**$48,964**	

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its

performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Robert R. Lazar Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	127.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	67.3	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Robert R. Lazar Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	91.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	55.5	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 63.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**~~**Appendix B: EPA Statement of Energy Performance**~~.

For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

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A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

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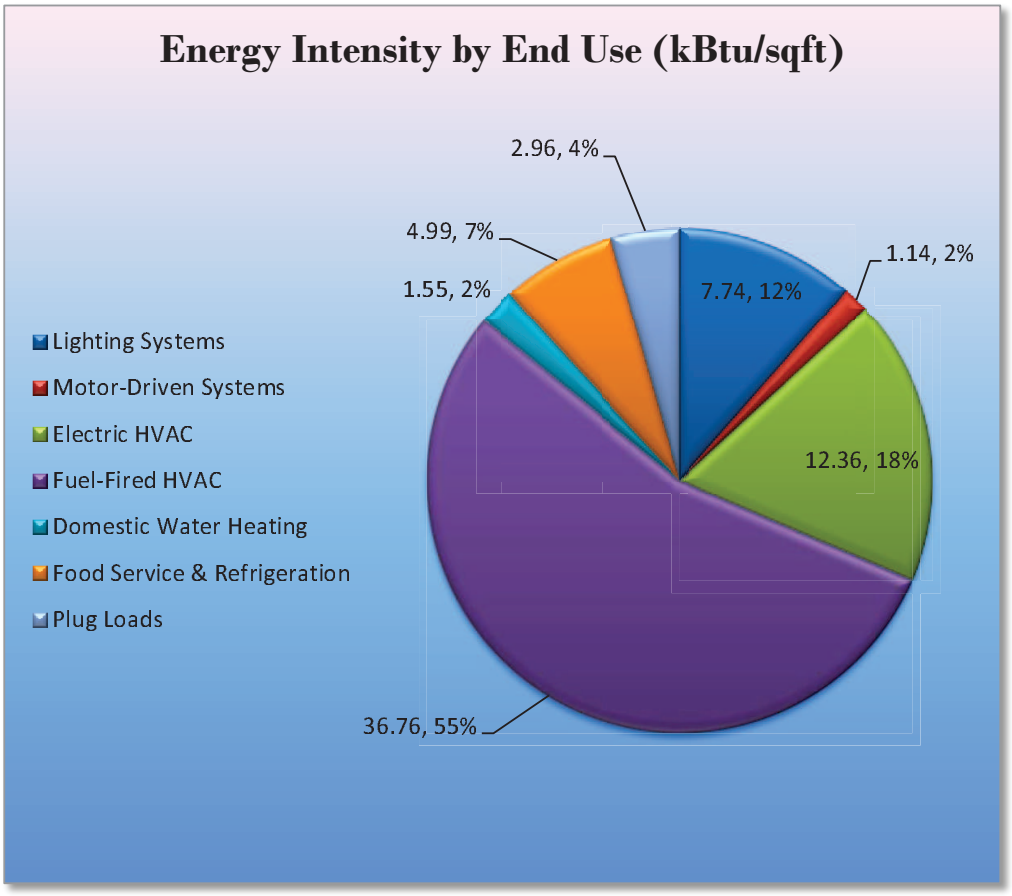
3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 15 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Robert R. Lazar Middle School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**164,251**	**48.5**	**0.0**	**$19,197.84**	**$138,869.35**	**$21,895.00**	**$116,974.35**	**6.1**	**165,400**
ECM 1	Install LED Fixtures	28,787	9.3	0.0	$3,364.60	$31,885.97	$3,940.00	$27,945.97	8.3	28,988
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	23,303	6.9	0.0	$2,723.63	$23,236.00	$2,100.00	$21,136.00	7.8	23,466
ECM 3	Retrofit Fixtures with LED Lamps	112,162	32.4	0.0	$13,109.61	$83,747.39	$15,855.00	$67,892.39	5.2	112,946
Lighting Control Measures		**32,666**	**9.4**	**0.0**	**$3,818.08**	**$17,628.00**	**$2,310.00**	**$15,318.00**	**4.0**	**32,895**
ECM 4	Install Occupancy Sensor Lighting Controls	29,607	8.6	0.0	$3,460.48	$16,584.00	$2,310.00	$14,274.00	4.1	29,814
ECM 5	Install High/Low Lighitng Controls	3,060	0.8	0.0	$357.60	$1,044.00	$0.00	$1,044.00	2.9	3,081
Variable Frequency Drive (VFD) Measures		**5,720**	**1.9**	**0.0**	**$668.58**	**$7,213.60**	**$0.00**	**$7,213.60**	**10.8**	**5,760**
ECM 6	Install VFDs on Hot Water Pumps	5,720	1.9	0.0	$668.58	$7,213.60	$0.00	$7,213.60	10.8	5,760
Electric Unitary HVAC Measures		**148,961**	**100.2**	**0.0**	**$17,410.67**	**$254,296.82**	**$13,733.00**	**$240,563.82**	**13.8**	**150,002**
ECM 7	Install High Efficiency Electric AC	148,961	100.2	0.0	$17,410.67	$254,296.82	$13,733.00	$240,563.82	13.8	150,002
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**14.6**	**$157.09**	**$2,265.73**	**$400.00**	**$1,865.73**	**11.9**	**1,709**
ECM 8	Install High Efficiency Furnaces	0	0.0	14.6	$157.09	$2,265.73	$400.00	$1,865.73	11.9	1,709
HVAC System Improvements		**20,061**	**4.5**	**0.0**	**$2,344.79**	**$5,300.00**	**$1,750.00**	**$3,550.00**	**1.5**	**20,202**
ECM 9	Install Dual Enthalpy Outside Economizer Control	20,061	4.5	0.0	$2,344.79	$5,300.00	$1,750.00	$3,550.00	1.5	20,202
Domestic Water Heating Upgrade		**0**	**0.0**	**35.4**	**$381.35**	**$222.27**	**$0.00**	**$222.27**	**0.6**	**4,149**
ECM 10	Install Low-Flow Domestic Hot Water Devices	0	0.0	35.4	$381.35	$222.27	$0.00	$222.27	0.6	4,149
Plug Load Equipment Control - Vending Machine		**6,790**	**0.0**	**0.0**	**$793.61**	**$1,150.00**	**$0.00**	**$1,150.00**	**1.4**	**6,837**
ECM 11	Vending Machine Control	6,790	0.0	0.0	$793.61	$1,150.00	$0.00	$1,150.00	1.4	6,837
TOTALS		**378,450**	**164.5**	**50.0**	**$44,772.00**	**$426,945.78**	**$40,088.00**	**$386,857.78**	**8.6**	**386,954**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**164,251**	**48.5**	**0.0**	**$19,197.84**	**$138,869.35**	**$21,895.00**	**$116,974.35**	**6.1**	**165,400**
ECM 1	Install LED Fixtures	28,787	9.3	0.0	$3,364.60	$31,885.97	$3,940.00	$27,945.97	8.3	28,988
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	23,303	6.9	0.0	$2,723.63	$23,236.00	$2,100.00	$21,136.00	7.8	23,466
ECM 3	Retrofit Fixtures with LED Lamps	112,162	32.4	0.0	$13,109.61	$83,747.39	$15,855.00	$67,892.39	5.2	112,946

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for a detailed list of the locations and recommended upgrades for each lighting measure.

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ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	14,961	4.0	0.0	$1,748.70	$17,040.24	$140.00	$16,900.24	9.7	15,066
Exterior	13,825	5.2	0.0	$1,615.89	$14,845.73	$3,800.00	$11,045.73	6.8	13,922

Measure Description

We recommend replacing existing fixtures containing metal halide lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	23,303	6.9	0.0	$2,723.63	$23,236.00	$2,100.00	$21,136.00	7.8	23,466
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent T12 fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	111,966	32.3	0.0	$13,086.73	$83,566.33	$15,850.00	$67,716.33	5.2	112,749
Exterior	196	0.1	0.0	$22.88	$181.05	$5.00	$176.05	7.7	197

Measure Description

We recommend retrofitting existing linear fluorescent T8 lamps, incandescent and compact fluorescent lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**32,666**	**9.4**	**0.0**	**$3,818.08**	**$17,628.00**	**$2,310.00**	**$15,318.00**	**4.0**	**32,895**
ECM 4	Install Occupancy Sensor Lighting Controls	29,607	8.6	0.0	$3,460.48	$16,584.00	$2,310.00	$14,274.00	4.1	29,814
ECM 5	Install High/Low Lighitng Controls	3,060	0.8	0.0	$357.60	$1,044.00	$0.00	$1,044.00	2.9	3,081

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** ~~Appendix A: Equipment Inventory & Recommendations~~ for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

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ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
29,607	8.6	0.0	$3,460.48	$16,584.00	$2,310.00	$14,274.00	4.1	29,814

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all classrooms, restrooms and offices. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 5: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,060	0.8	0.0	$357.60	$1,044.00	$0.00	$1,044.00	2.9	3,081

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are interior corridors. Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		5,720	1.9	0.0	$668.58	$7,213.60	$0.00	$7,213.60	10.8	5,760
ECM 7	Install VFDs on Hot Water Pumps	5,720	1.9	0.0	$668.58	$7,213.60	$0.00	$7,213.60	10.8	5,760

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for more information about current motors systems and VFD recommendations.

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ECM 6: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,720	1.9	0.0	$668.58	$7,213.60	$0.00	$7,213.60	10.8	5,760

Measure Description

We recommend installing a variable frequency drives (VFD) to control the two hot water circulation pumps located in boiler room2. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 20 below.

Figure 20 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**148,961**	**100.2**	**0.0**	**$17,410.67**	**$254,296.82**	**$13,733.00**	**$240,563.82**	**13.8**	**150,002**
ECM 8	Install High Efficiency Electric AC	148,961	100.2	0.0	$17,410.67	$254,296.82	$13,733.00	$240,563.82	13.8	150,002

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for more information about existing HVAC equipment and proposed upgrades.

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ECM 7: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
148,961	100.2	0.0	$17,410.67	$254,296.82	$13,733.00	$240,563.82	13.8	150,002

Measure Description

We recommend replacing standard efficiency packaged and split air conditioning units with high efficiency packaged and split air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

4.1.5 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 21 below.

Figure 21 - Summary of Gas-Fired Heating Replacement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**14.6**	**$157.09**	**$2,265.73**	**$400.00**	**$1,865.73**	**11.9**	**1,709**
ECM 9	Install High Efficiency Furnaces	0	0.0	14.6	$157.09	$2,265.73	$400.00	$1,865.73	11.9	1,709

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for more details on existing

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ECM 8: Install High Efficiency Furnaces

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	14.6	$157.09	$2,265.73	$400.00	$1,865.73	11.9	1,709

Measure Description

We recommend replacing existing standard efficiency furnace serving the hallway with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

4.1.6 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 22 below.

Figure 22 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**20,061**	**4.5**	**0.0**	**$2,344.79**	**$5,300.00**	**$1,750.00**	**$3,550.00**	**1.5**	**20,202**
ECM 10	Install Dual Enthalpy Outside Economizer Control	20,061	4.5	0.0	$2,344.79	$5,300.00	$1,750.00	$3,550.00	1.5	20,202

ECM 9: Install Dual-Enthalpy Economizers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
20,061	4.5	0.0	$2,344.79	$5,300.00	$1,750.00	$3,550.00	1.5	20,202

Measure Description

We recommend installing dual enthalpy economizers to control a ventilation system's outside air intake of the packaged units which will to reduce a facility's total cooling load. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy.

Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

4.1.7 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 23 below.

Figure 23 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**35.4**	**$381.35**	**$222.27**	**$0.00**	**$222.27**	**0.6**	**4,149**
ECM 11	Install Low-Flow Domestic Hot Water Devices	0	0.0	35.4	$381.35	$222.27	$0.00	$222.27	0.6	4,149

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory & Recommendations~~ for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

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ECM 10: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	35.4	$381.35	$222.27	$0.00	$222.27	0.6	4,149

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.8 Plug Load Equipment Control - Vending Machines

ECM 11: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
6,790	0.0	0.0	$793.61	$1,150.00	$0.00	$1,150.00	1.4	6,837

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

Please see Appendix A: Equipment Inventory & Recommendations~~Appendix A: Equipment Inventory &~~ equipment and proposed measures.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5 to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

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Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

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Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.74.1.8 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

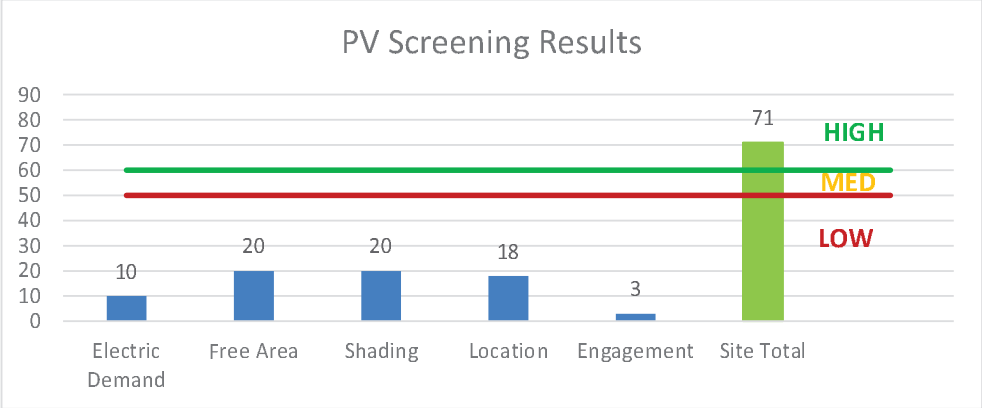
The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Photovoltaic

Robert R. Lazar Middle School has a 73.37 kW solar photovoltaic (PV) system installed on the roof. A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **high** potential for installing an additional PV array.

Figure 24 - Photovoltaic Screening



Potential	High	
System Potential	215	kW DC STC
Electric Generation	256,145	kWh/yr
Displaced Cost	$22,280	/yr
Installed Cost	$559,000	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.4 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ:** http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs:** http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market:** http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

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6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a **Low** potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

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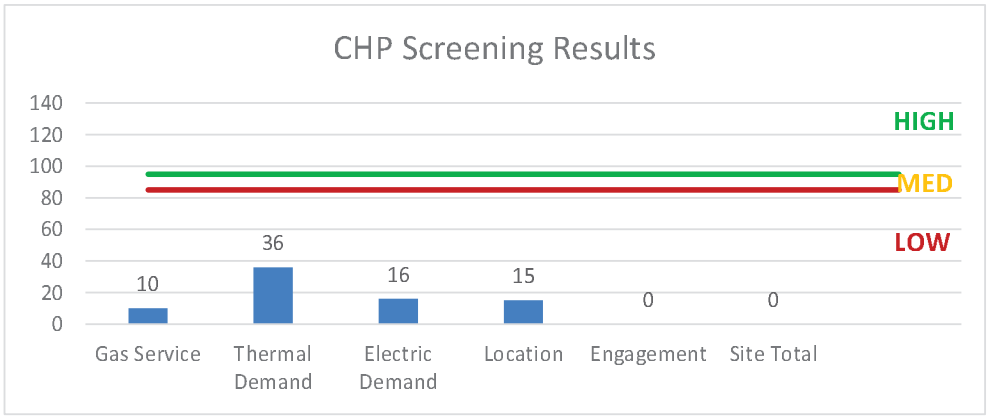
Figure 25 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

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Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

In our opinion Robert R. Lazar Middle School is not a good candidate for DR due to limited load to be shed.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 26 for a list of the eligible programs identified for each recommended ECM.

Figure 26 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x			x		
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x			x		
ECM 3	Retrofit Fixtures with LED Lamps	x			x		
ECM 4	Install Occupancy Sensor Lighting Controls	x			x		
ECM 5	Install High/Low Lighitng Controls				x		
ECM 6	Install VFDs on Hot Water Pumps				x		
ECM 7	Install High Efficiency Electric AC	x			x		
ECM 8	Install High Efficiency Furnaces	x			x		
ECM 9	Install Dual Enthalpy Outside Economizer Control	x			x		
ECM 10	Install Low-Flow Domestic Hot Water Devices				x		
ECM 11	Vending Machine Control				x		

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

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8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

Field Code Cha

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific

eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

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8.3 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.10/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors)

or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P

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8.4 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec

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8.5 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

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Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

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9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

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Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room1	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,848	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,848	0.15	491	0.0	$57.38	$409.50	$70.00	5.92
Boiler Room2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,112	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,112	0.06	240	0.0	$28.10	$175.50	$30.00	5.18
Boiler Room1	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Perimeter Light (Wall Pack) Exit 18	2	Compact Fluorescent: 2x13W CFL 2-pin	Daylight Dimming	26	1,507	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Daylight Dimming	7	1,507	0.02	66	0.0	$7.69	$127.30	$0.00	16.54
Perimeter Light (Wall Pack) Exit 15	1	Halogen Incandescent: Recessed PAR38 90W	Daylight Dimming	90	1,507	Relamp	No	1	LED Screw-In Lamps: Downlight Solid State Retrofit	Daylight Dimming	15	1,507	0.05	130	0.0	$15.19	$53.75	$5.00	3.21
Perimeter	12	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	1,507	Fixture Replacement	No	12	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	85	1,507	1.65	4,366	0.0	$510.28	$4,688.12	$1,200.00	6.84
Perimeter	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	44	1,507	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	44	1,507	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Back Parking Lot Light	7	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	1,507	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	85	1,507	0.96	2,547	0.0	$297.66	$2,734.74	$700.00	6.84
Front Entrance	9	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	1,507	Fixture Replacement	No	9	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	85	1,507	1.24	3,274	0.0	$382.71	$3,516.09	$900.00	6.84
Gymn Side Parking Lot	10	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	1,507	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	85	1,507	1.38	3,638	0.0	$425.24	$3,906.77	$1,000.00	6.84
Gymnasium	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,112	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,478	0.87	3,209	0.0	$375.06	$2,176.40	$360.00	4.84
Gymnasium	28	Metal Halide: (1) 250W Lamp	Wall Switch	295	2,112	Fixture Replacement	No	28	LED - Fixtures: Downlight Pendant	Wall Switch	75	2,112	4.04	14,961	0.0	$1,748.70	$17,040.24	$140.00	9.66
Gymn Stage	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,584	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,584	0.07	191	0.0	$22.36	$215.40	$30.00	8.29
Gymn Stage	24	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	1,584	Relamp & Reballast	No	24	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,584	0.50	1,377	0.0	$160.96	$2,352.00	$120.00	13.87
Gymn Stage	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,540	0.07	198	0.0	$23.18	$190.27	$40.00	6.48
Gymn Office1	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	0.10	297	0.0	$34.73	$306.27	$60.00	7.09
Gymn Office1	1	Compact Fluorescent: 13W CFL 2-pin	Wall Switch	13	1,760	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	5	1,760	0.01	16	0.0	$1.89	$53.65	$0.00	28.35
Girls Locker Room	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.08	235	0.0	$27.44	$252.80	$0.00	9.21
Girls Locker Room	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	1,760	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.08	255	0.0	$29.81	$392.00	$20.00	12.48
Girls Locker Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	0.29	891	0.0	$104.18	$686.80	$140.00	5.25
Boys Locker Room	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	1,760	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.08	255	0.0	$29.81	$392.00	$20.00	12.48
Boys Locker Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	0.29	891	0.0	$104.18	$686.80	$140.00	5.25
Boys Locker Room	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.04	117	0.0	$13.72	$126.40	$0.00	9.21
Boys Locker Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gymn Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.05	148	0.0	$17.26	$233.00	$20.00	12.34
Gymn Office (Boys)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.05	169	0.0	$19.73	$233.00	$20.00	10.80
Gymn Office (Girls)	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,760	Relamp & Reballast	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,760	0.15	478	0.0	$55.83	$323.67	$40.00	5.08
Electrical Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,540	0.02	58	0.0	$6.83	$58.50	$10.00	7.10
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$7.81	$58.50	$10.00	6.21
Cafeteria	66	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	66	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	2.71	9,400	0.0	$1,098.70	$6,583.20	$1,200.00	4.90
Cafeteria	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria (Storage)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.05	169	0.0	$19.73	$233.00	$20.00	10.80
Kitchen	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	No	13	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,980	0.48	1,658	0.0	$193.75	$1,236.73	$260.00	5.04
Kitchen (Storage1)	1	Compact Fluorescent: 32W Screw-in	Wall Switch	32	1,540	Relamp	No	1	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	11	1,540	0.01	37	0.0	$4.35	$53.75	$0.00	12.37
Restroom	3	Compact Fluorescent: 13W CFL 2-pin	Wall Switch	13	1,540	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	1,540	0.02	53	0.0	$6.21	$63.65	$0.00	10.25
Kitchen (Storage2)	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,078	0.10	260	0.0	$30.39	$306.27	$40.00	8.76
Front Entrance Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.13	451	0.0	$52.70	$351.00	$60.00	5.52
6th Grade hallway	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,540	1.31	5,064	0.0	$591.89	$3,156.00	$480.00	4.52
6th Grade hallway	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
7th Grade hallway	57	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	57	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,540	1.56	6,014	0.0	$702.87	$3,682.50	$570.00	4.43
7th Grade hallway	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
8th Grade hallway	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	34	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,540	0.93	3,587	0.0	$419.26	$2,337.00	$340.00	4.76
8th Grade hallway	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
8th Grade hallway	12	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,200	Relamp	No	12	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,200	0.22	835	0.0	$97.58	$740.40	$180.00	5.74
8th Grade hallway	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	11	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,200	0.21	807	0.0	$94.33	$695.20	$0.00	7.37
Teacher Room	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.82	2,849	0.0	$332.94	$1,736.00	$340.00	4.19
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.05	190	0.0	$22.20	$233.00	$20.00	9.60
Room 12	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.06	225	0.0	$26.35	$175.50	$30.00	5.52
Room 12	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.10	334	0.0	$39.07	$306.27	$60.00	6.30

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 13	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.27	950	0.0	$110.98	$701.00	$120.00	5.24
Room 14	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.44	1,519	0.0	$177.57	$1,168.00	$200.00	5.45
Room 15	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,109.50	$40.00	3.96
Room 16	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,980	0.15	510	0.0	$59.61	$380.53	$80.00	5.04
Room 16	4	Incandescent: 60 W A Lamp	Wall Switch	60	1,980	Relamp	No	4	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	15	1,980	0.12	410	0.0	$47.90	$215.01	$20.00	4.07
Room 16	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.18	617	0.0	$72.07	$584.00	$60.00	7.27
Room 17	8	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.36	1,233	0.0	$144.14	$1,052.00	$100.00	6.60
Room 17	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.15	526	0.0	$61.48	$409.50	$70.00	5.52
Room 18	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$17.57	$117.00	$20.00	5.52
Room 18	22	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	22	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.68	2,374	0.0	$277.53	$3,792.33	$480.00	11.94
Room 19	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.19	676	0.0	$79.04	$526.50	$90.00	5.52
Room 20	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 21	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 22	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 23	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 24	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 25	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 26	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.67	2,312	0.0	$270.26	$1,987.00	$190.00	6.65
Room 27	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.49	1,709	0.0	$199.76	$1,018.40	$180.00	4.20
Room 28	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.49	1,709	0.0	$199.76	$1,018.40	$180.00	4.20
Room 29	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.49	1,709	0.0	$199.76	$1,018.40	$180.00	4.20
Room 30	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.49	1,709	0.0	$199.76	$1,018.40	$180.00	4.20
Girl Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.08	222	0.0	$25.90	$291.50	$30.00	10.10
Assistant Principal	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.16	570	0.0	$66.59	$416.80	$80.00	5.06
Mrs masanko Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.08	253	0.0	$29.59	$266.40	$50.00	7.31

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Women Restroom	2	Compact Fluorescent: 13W CFL 2-pin	Wall Switch	13	1,540	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	5	1,540	0.01	28	0.0	$3.31	$107.30	$0.00	32.40
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,540	0.02	58	0.0	$6.83	$58.50	$10.00	7.10
Head Custodian	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.08	253	0.0	$29.59	$291.50	$50.00	8.16
Miss Mazur Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.05	169	0.0	$19.73	$233.00	$20.00	10.80
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.05	169	0.0	$19.73	$233.00	$20.00	10.80
Guidance Suite	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	0.34	1,040	0.0	$121.55	$781.93	$160.00	5.12
Guidance Suite	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.04	117	0.0	$13.72	$126.40	$0.00	9.21
Closet	1	Compact Fluorescent: 32W Screen-in	Wall Switch	32	1,760	Relamp	No	1	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	9	1,760	0.02	47	0.0	$5.44	$53.75	$0.00	9.88
Girl Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.05	169	0.0	$19.73	$349.00	$20.00	16.68
SAC Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	0.10	297	0.0	$34.73	$422.27	$80.00	9.86
Room 1	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 2	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 3	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 4	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 5	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 6	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 7	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$17.57	$117.00	$20.00	5.52
Room 7	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.29	1,003	0.0	$117.21	$686.80	$140.00	4.67
Room 8	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Room 9	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 10	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.57	1,994	0.0	$233.06	$1,460.50	$250.00	5.19
Principal Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.22	761	0.0	$88.94	$416.80	$80.00	3.79
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.11	380	0.0	$44.47	$266.40	$50.00	4.87
Storage Room	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,980	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.09	308	0.0	$36.04	$350.00	$40.00	8.60
Teacher Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$17.57	$117.00	$20.00	5.52

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Men Restroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,078	0.08	207	0.0	$24.16	$305.60	$0.00	12.65
Teacher Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,078	0.10	260	0.0	$30.39	$306.27	$60.00	8.10
Room 31	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.58	2,006	0.0	$234.41	$1,257.60	$260.00	4.26
Room 33	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.29	1,003	0.0	$117.21	$686.80	$140.00	4.67
Room 34	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.29	1,003	0.0	$117.21	$686.80	$140.00	4.67
Room 35	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.96	3,343	0.0	$390.69	$2,134.67	$440.00	4.34
Electrical Room	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,100	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.12	224	0.0	$26.17	$351.00	$30.00	12.27
Electrical Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.09	167	0.0	$19.52	$234.00	$40.00	9.94
Room 37 (Library)	41	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	41	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	1.97	6,852	0.0	$800.91	$4,364.47	$900.00	4.33
Room 37 (Library)	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.22	751	0.0	$87.83	$585.00	$100.00	5.52
Library Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.10	334	0.0	$39.07	$306.27	$60.00	6.30
Library Classroom	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Mrs Mekf Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.10	334	0.0	$39.07	$306.27	$60.00	6.30
Miss Holman Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.10	334	0.0	$39.07	$306.27	$60.00	6.30
Mrs Friedman Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,980	0.04	128	0.0	$14.90	$95.13	$20.00	5.04
Room 38	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.10	334	0.0	$39.07	$306.27	$60.00	6.30
Room 38	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,980	0.02	66	0.0	$7.72	$63.20	$0.00	8.19
Room 39	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.29	1,003	0.0	$117.21	$686.80	$140.00	4.67
Women Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,540	0.02	58	0.0	$6.83	$58.50	$10.00	7.10
Men Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,540	0.02	58	0.0	$6.83	$58.50	$10.00	7.10
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.05	148	0.0	$17.26	$233.00	$20.00	12.34
Boys Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$6.00	$63.20	$0.00	10.53
Girls Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$6.00	$63.20	$0.00	10.53
Girls Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.05	148	0.0	$17.26	$233.00	$20.00	12.34
Electrical Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,430	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,430	0.02	54	0.0	$6.34	$58.50	$10.00	7.65

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 40	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.72	2,507	0.0	$293.02	$1,659.00	$340.00	4.50
Room 40	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 41	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 41	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.72	2,507	0.0	$293.02	$1,659.00	$340.00	4.50
Room 42	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.72	2,507	0.0	$293.02	$1,659.00	$340.00	4.50
Room 42	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 43	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 44	12	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,980	Relamp & Reballast	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	1.07	3,700	0.0	$432.42	$2,058.00	$260.00	4.16
Room 45	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 46	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 47	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,430	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,430	0.02	54	0.0	$6.34	$58.50	$10.00	7.65
Room 48	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 49	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 50	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 51	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 52	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 53	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 54	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 56	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 57	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 58	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Room 59	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.43	1,504	0.0	$175.81	$972.20	$200.00	4.39
Closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,430	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,001	0.11	274	0.0	$32.06	$350.00	$40.00	9.67
Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,430	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,430	0.02	48	0.0	$5.57	$63.20	$0.00	11.34

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Electrical Closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,430	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,430	0.11	276	0.0	$32.29	$285.40	$60.00	6.98
Men Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$6.00	$63.20	$0.00	10.53
Women Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,540	0.03	88	0.0	$10.25	$75.20	$15.00	5.88
Room 60	18	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	1,980	Relamp	Yes	18	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,386	0.41	1,441	0.0	$168.39	$1,342.60	$310.00	6.13
Room 61	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	1,980	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	1,980	0.02	63	0.0	$7.32	$61.70	$15.00	6.38
Room 61	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.72	2,507	0.0	$293.02	$1,659.00	$340.00	4.50
Room 62	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.58	2,006	0.0	$234.41	$1,257.60	$260.00	4.26
Room 63	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.58	2,006	0.0	$234.41	$1,257.60	$260.00	4.26
Room 64	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.53	1,838	0.0	$214.88	$1,162.47	$240.00	4.29
Room 65	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.53	1,838	0.0	$214.88	$1,162.47	$240.00	4.29
Electrical Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.05	127	0.0	$14.80	$233.00	$20.00	14.39
Room 55	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,386	0.19	669	0.0	$78.14	$496.53	$100.00	5.07
Data Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.05	190	0.0	$22.20	$233.00	$20.00	9.60
Women Restroom	1	Compact Fluorescent: 13W CFL 2-pin	Wall Switch	13	1,540	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	1,540	0.00	7	0.0	$0.83	$63.65	$0.00	76.87
Girls Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,078	0.10	260	0.0	$30.39	$306.27	$60.00	8.10
Room 31	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.16	570	0.0	$66.59	$467.00	$80.00	5.81

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room1	School Building	1	Heating Hot Water Pump	3.0	89.5%	Yes	1,040	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room1	School Building	1	Heating Hot Water Pump	1.5	86.5%	Yes	1,040	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room1	School Building	1	Heating Hot Water Pump	3.0	89.5%	Yes	1,040	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room1	School Building	1	Heating Hot Water Pump	1.5	86.5%	Yes	1,040	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room1	Boiler Room	1	Air Compressor	2.0	82.5%	No	390	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room1	School Building	2	Other	3.0	89.5%	No	1,040	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room2	Boiler Room2	2	Combustion Air Fan	2.0	78.5%	No	1,040	No	78.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room2	Boiler Room2	2	Heating Hot Water Pump	7.5	88.5%	No	1,040	No	88.5%	Yes	2	1.91	5,720	0.0	$668.58	$7,213.60	$0.00	10.79
Roof Top	Restrooms	1	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Teacher's Cafeteria/Library	2	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Cafeteria/Hallway	2	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	6th/7th Grade Hallway	2	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Kitchen	1	Kitchen Hood Exhaust Fan	0.8	72.5%	No	1,040	No	72.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Kitchen's Storage Room	1	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 32/35/37/39/Photography Room	5	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Rooms 29/34/Electrical Closet/Hallway	4	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallways/Restroom/Gym/Office	7	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallways	2	Exhaust Fan	0.8	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallways	1	Exhaust Fan	0.3	71.3%	No	1,040	No	71.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gymnasium Closet	Gymnasium	1	Supply Fan	3.0	82.0%	No	1,040	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof Top	School Building	3	Supply Fan	2.0	81.0%	No	1,040	No	81.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	3	Other	1.0	80.0%	No	1,040	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	1	Other	10.0	80.0%	No	1,040	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	1	Other	5.0	80.0%	No	1,040	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
School	School Building	53	Other	0.1	78.0%	No	0	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	6	Other	1.0	82.0%	No	0	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	2	Supply Fan	10.0	91.5%	No	0	No	91.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	2	Exhaust Fan	5.0	89.5%	No	0	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Library - RTU 7	1	Other	0.5	81.7%	No	0	No	81.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Library - RTU 7	1	Supply Fan	5.0	86.7%	No	0	No	86.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	School Building	19	Supply Fan	0.3	81.5%	No	0	No	81.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof Top	Teacher's Cafeteria	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 19	1	Split-System AC	1.50		Yes	1	Split-System AC	1.50		14.00		No	0.99	1,424	0.0	$166.46	$2,244.33	$138.00	12.65
Roof Top	Room 41	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 40	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 43	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 42	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 46	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 48	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 47	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 49	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 51	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 50	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 54	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 56	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 44	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Room 58	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	2.32	3,323	0.0	$388.40	$5,236.77	$322.00	12.65
Roof Top	Guidance Room	1	Split-System AC	4.00		Yes	1	Split-System AC	4.00		14.00		No	2.65	3,798	0.0	$443.89	$5,984.88	$368.00	12.65
Roof Top	Room 57	1	Split-System AC	4.00		Yes	1	Split-System AC	4.00		14.00		No	2.65	3,798	0.0	$443.89	$5,984.88	$368.00	12.65
Roof Top	School	2	Packaged AC	10.00		Yes	2	Packaged AC	10.00		11.50		Yes	12.06	21,182	0.0	$2,475.75	$37,142.11	$1,960.00	14.21
RTU10	Room 31	1	Split-System AC	7.50		Yes	1	Split-System AC	7.50		11.50		No	4.03	5,779	0.0	$675.49	$8,728.28	$547.50	12.11

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
RTU 9	Room 32	1	Split-System AC	7.50		Yes	1	Split-System AC	7.50		11.50		No	4.03	5,779	0.0	$675.49	$8,728.28	$547.50	12.11
RTU 8	Room 39	1	Packaged AC	7.50		Yes	1	Packaged AC	7.50		11.50		Yes	4.52	7,943	0.0	$928.41	$14,115.79	$797.50	14.35
RTU 5	Room 35	1	Packaged AC	4.00		Yes	1	Packaged AC	4.00		14.00		Yes	2.95	5,105	0.0	$596.70	$9,575.84	$618.00	15.01
Roof Top	Room 37	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	1.33	1,899	0.0	$221.95	$2,992.44	$184.00	12.65
RTU 7	Library	1	Packaged Terminal HP	15.00	46.00	Yes	1	Packaged AC	15.00		11.50		Yes	9.04	21,279	0.0	$2,487.12	$21,807.75	$1,435.00	8.19
Mrs. Masanko Office	Mrs. Masanko Office	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 45	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 52	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 53	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	1.66	2,374	0.0	$277.43	$3,740.55	$230.00	12.65
Roof Top	Room 55	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	1.99	2,848	0.0	$332.92	$4,488.66	$276.00	12.65
Roof Top	Server Room	1	Split-System AC	1.00		Yes	1	Split-System AC	1.00		14.00		No	0.66	949	0.0	$110.97	$1,496.22	$92.00	12.65
Roof Top	Room 59	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallway	1	Split-System AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 61	1	Split-System AC	1.50		Yes	1	Split-System AC	1.50		14.00		No	0.99	1,424	0.0	$166.46	$2,244.33	$138.00	12.65
Roof Top	Main Office	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	3.31	4,747	0.0	$554.86	$7,481.10	$460.00	12.65
Roof Top	SAC	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	1.33	1,899	0.0	$221.95	$2,992.44	$184.00	12.65
Roof Top	Gymnasium Office	1	Split-System AC	1.00		Yes	1	Split-System AC	1.00		14.00		No	0.66	949	0.0	$110.97	$1,496.22	$92.00	12.65
Roof Top	Room 3	1	Ductless Mini-Split HP	2.50	32.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 1	1	Ductless Mini-Split HP	2.50	32.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Rooms 61,63,65	1	Packaged AC	10.00		Yes	1	Packaged AC	10.00		11.50		Yes	6.03	10,591	0.0	$1,237.87	$18,571.06	$980.00	14.21

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof Top	Rooms 60,62,64	1	Packaged AC	12.50		Yes	1	Packaged AC	12.50		11.50		Yes	7.54	13,239	0.0	$1,547.34	$18,323.13	$1,237.50	11.04
Roof Top	Cafeteria/Kitchen	2	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 18	1	Ductless Mini-Split HP	2.50	30.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 20	1	Ductless Mini-Split HP	2.50	30.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 22	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 17	1	Ductless Mini-Split HP	2.50	30.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 15	1	Ductless Mini-Split HP	1.50	18.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 13	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 2	1	Ductless Mini-Split HP	2.50	32.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 14	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 23	1	Ductless Mini-Split HP	2.50	30.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 27	1	Ductless Mini-Split HP	3.00	36.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Room 28	1	Ductless Mini-Split HP	3.00	36.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rear Building	Copy Room	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 4	Room 4	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 5	Room 5	1	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 7	Room 7	1	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 8	Room 8	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 10	Room 10	1	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 12	Room 12	1	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 16	Room 16	1	Window AC	2.00		Yes	1	Window AC	2.00		12.00		No	1.13	1,625	0.0	$189.89	$2,177.52	$0.00	11.47
Room	Room	1	Window AC	0.67		Yes	1	Window AC	0.67		12.00		No	0.38	544	0.0	$63.61	$729.47	$0.00	11.47
Room 30	Room 30	1	Ductless Mini-Split HP	3.00	36.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 24	Room 24	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room1	6th & 7th Grade Section	1	Condensing Hot Water Boiler	2,850.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room2	8th & Part of 7th Grade Grade	1	Condensing Hot Water Boiler	1,860.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room1	6th & 7th Grade Section	1	Condensing Hot Water Boiler	2,850.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room2	8th & Part of 7th Grade Grade	1	Condensing Hot Water Boiler	1,860.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Hallway	1	Furnace	100.00	Yes	1	Furnace	100.00	95.00%	AFUE	0.00	0	14.6	$157.09	$2,265.73	$400.00	11.88

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room1	6th & 7th Grade Section	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical Closet	8th Grade Section	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
School	28	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	36.2	$389.70	$200.76	$0.00	0.52
Kitchen	3	Faucet Aerator (Kitchen)	2.00	2.20	0.00	0	-0.8	-$8.35	$21.51	$0.00	-2.58

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Gas Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Insulated Food Holding Cabinet (3/4 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Kitchen	4	Refrigerator	258.0	No
Teacher Room	2	Refrigerator	175.0	No
School	6	Microwave	850.0	No
School	5	Coffee Machine	700.0	No
School	193	Desktop with LCD Monitors	191.0	Yes
Cafeteria	3	Refrigerator	145.0	Yes
Cafeteria	1	Food Warmer	1,810.0	No
Kitchen	1	Food Warmer	1,810.0	No
Cafeteria	1	Refrigerator	127.0	Yes
School	12	Copy Machine	1,000.0	Yes
School	15	Small Printer	46.0	Yes
Room 39	1	Refrigerator	145.0	Yes
Room 39	1	Electric Oven	1,200.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	3	Refrigerated	Yes	0.00	4,836	0.0	$565.18	$690.00	$0.00	1.22
Teacher Room	1	Refrigerated	Yes	0.00	1,612	0.0	$188.39	$230.00	$0.00	1.22
Teacher Room	1	Non-Refrigerated	Yes	0.00	343	0.0	$40.03	$230.00	$0.00	5.75

Appendix B: EPA Statement of Energy Performance

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Robert R. Lazar Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 113,900
Built: 1953

For Year Ending: January 31, 2016
Date Generated: September 14, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Robert R. Lazar Middle School 123 Changebridge Road Montville, New Jersey 07045	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5944342

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
82.1 kBtu/ft²

Source EUI
137.8 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	6,242,679 (67%)
Electric - Grid (kBtu)	2,821,323 (30%)
Electric - Solar (kBtu)	286,628 (3%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	92.9
National Median Source EUI (kBtu/ft²)	156.1
% Diff from National Median Source EUI	-12%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	645

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp
(if applicable)

Local Government Energy Audit:
Energy Audit Report

Montville High School

Montville Township Public Schools

100 Horseneck Road
Montville, NJ 07045

August 28, 2017

Draft Report by:
TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Montville High School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Montville High School is a 212,613 square foot facility comprised of various space types such as classrooms, science and computer laboratories, workshops, media center, cafeteria, fully equipped kitchen and two gymnasiums within the building. The normal operating hours for the students and teacher are 7:00AM to 3:00PM but the facility remains open until 11PM for various after school activities including sports and maintenance services.

Heating in the building is provided by condensing hot water boilers placed in two sections (original and addition). Majority of the space cooling in the building is provided using roof top packaged units with DX cooling. Smaller areas such as offices and few classrooms use split AC systems and window AC units (respectively) for cooling.

Lighting at Montville High School consists of a mixture of 2-foot and 4-foot T8 fixtures and a few areas have LED lights. Some other spaces are lit using compact fluorescents and incandescent bulbs. A thorough description of the facility and our observations are located in Section 2, "Facility Information and Existing Conditions".

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 11 measures which together represent an opportunity for Montville High School to reduce annual energy costs by roughly $58,984 and annual greenhouse gas emissions by 529,356 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 5.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Montville High School's annual energy use by 14%.

Figure 1 – Previous 12 Month Utility Costs

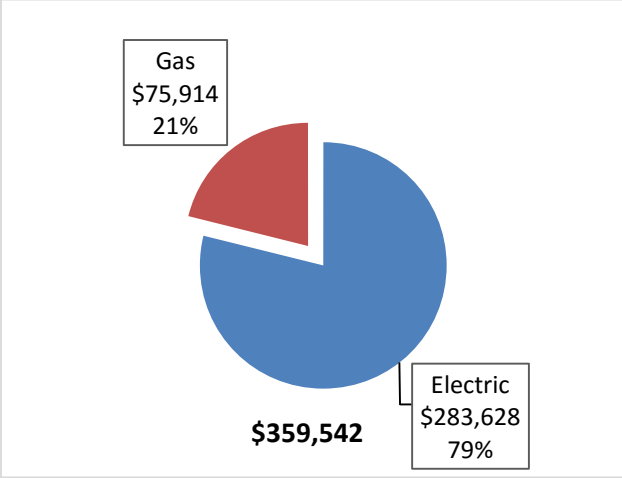
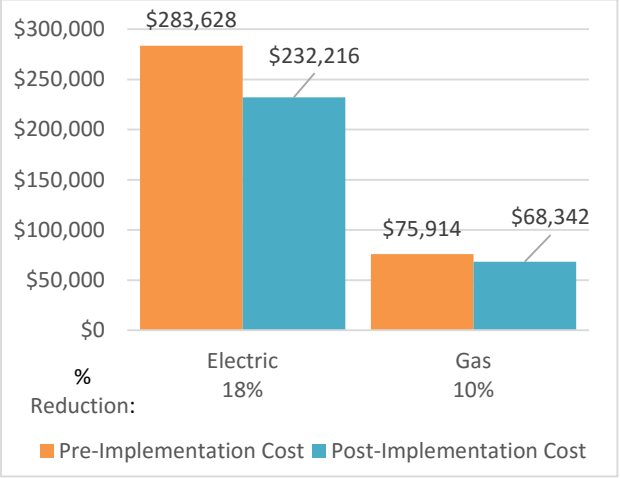


Figure 2 – Potential Post-Implementation Costs



A detailed description of Montville High School's existing energy use can be found in Section 3, "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			284,682	65.1	0.0	$33,063.97	$177,953.98	$29,460.00	$148,493.98	4.5	286,672
ECM 1	Install LED Fixtures	Yes	52,260	7.4	0.0	$6,069.69	$23,124.47	$4,390.00	$18,734.47	3.1	52,626
ECM 2	Retrofit Fixtures with LED Lamps	Yes	232,300	57.7	0.0	$26,980.23	$154,614.40	$25,070.00	$129,544.40	4.8	233,925
ECM 3	Install LED Exit Signs	Yes	121	0.0	0.0	$14.04	$215.11	$0.00	$215.11	15.3	122
Lighting Control Measures			32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858
Variable Frequency Drive (VFD) Measures			81,252	13.2	0.0	$9,436.89	$34,290.55	$5,040.00	$29,250.55	3.1	81,820
ECM 5	Install VFDs on Constant Volume (CV) HVAC	Yes	33,922	8.4	0.0	$3,939.86	$21,621.95	$5,040.00	$16,581.95	4.2	34,159
ECM 6	Install VFDs on Hot Water Pumps	Yes	47,330	4.8	0.0	$5,497.04	$12,668.60	$0.00	$12,668.60	2.3	47,661
Electric Unitary HVAC Measures			22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583
ECM 7	Install High Efficiency Electric AC	Yes	22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583
HVAC System Improvements			7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214
ECM 8	Install Dual Enthalpy Outside Economizer Control	Yes	7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214
Domestic Water Heating Upgrade			0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927
ECM 9	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927
Food Service Equipment & Refrigeration Measures			0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674
ECM 10	Food Service Equipment Replacement	Yes	0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674
Plug Load Equipment Control - Vending Machine			14,507	0.0	0.0	$1,684.85	$2,070.00	$0.00	$2,070.00	1.2	14,608
ECM 11	Vending Machine Control	Yes	14,507	0.0	0.0	$1,684.85	$2,070.00	$0.00	$2,070.00	1.2	14,608
TOTALS			442,660	101.8	714.0	$58,984.40	$350,203.29	$44,770.00	$305,433.29	5.2	529,356

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration. These measures save energy by reducing the energy usage with more energy efficient equipment.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC Energy Services also identified 9 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Montville High School include:

- Close Doors and Windows
- Use Window Treatments/Coverings
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Perform Proper Boiler Maintenance

- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Montville High School. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Pay for Performance - Existing Building (P4P)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as,

attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.7 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	Rene.Rovtar@montville.net	(973) 331-7100
Steven Toth	Facilities Manager	steven.toth@montville.net	973-331-7100 Extn: 2236
Rich Medwin	Maintenance Supervisor	Richard.Medwin@montville.net	973-331-7100 Extn: 2250
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 07, 2017, TRC Energy Services performed an energy audit at Montville High School located in Montville, NJ. TRC Energy Services' team met with Richard Medwin to review the facility operations and help focus our investigation on specific energy-using systems.

Montville High School is a 212,613 square foot facility comprised of various space types such as classrooms, science and computer laboratories, workshops, media center, cafeteria, fully equipped kitchen and two gymnasiums within the building. This is a multi-story building which was originally built in the 1970 and later expanded in 2003. The normal operating hours for the students and teacher are 7:00AM to 3:00PM but the facility remains open until 11PM for various after school activities including sports and maintenance services.

Heating in the building is provided via 8 condensing hot water boilers placed in two sections (4 each - original and addition). Majority of the space cooling in the building is provided using roof top packaged units with DX cooling. Smaller areas such as offices and few classrooms use split AC systems and window AC units (respectively) for cooling.

Lighting at Montville High School is using a mixture of 2-foot and 4-foot T8 tubes. Over the last few year they have made LED retrofits to specific areas. Some other spaces are lit using compact fluorescents and incandescent bulbs. By and large the school has inefficient lighting and are recommended for upgrades.

2.3 Building Occupancy

The typical schedule is presented in the table below. During the weekdays, the hours for the teachers and student are from 7AM – 3 PM but the facility remains open till 11PM for sports and maintenance. The weekend operating hours are also extensive and for similar reasons. During a typical day, the facility is occupied by approximately 200 full time staff (including teachers, admin and maintenance) and 1230 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Montville High School	Weekday	7AM - 3PM
Montville High School	Weekend	8 AM - 7 PM

2.4 Building Envelope

The high school is a multi-story building with varying roof heights. The core construction is using masonry block have brick and metal panel facades. The dividing walls in the various spaces of the building includes sheet rock, sinter block and brick. The building has a mixture of flat and pitched roof. The flat roof spaces are covered with asphalt and gravel membrane and the slightly pitched sections are made of standing seam metal roofing system. Most spaces in the school have double pane windows with the exception of a few sections. We suggest that these be upgraded to double pane windows with lower U-values. The exterior doors are aluminum framed, and about 20 years old.

Image 1 Building envelope pictures

2.5 On-Site Generation

Montville High School installed a 82.94 kW capacity solar PV panels. The project included photovoltaic (PV) arrays on the flat roof portions of the school. There are approximately 275 PV panels in total.

Sunlight General Capital, a power-purchase agreement provider, was the financier of these solar energy systems.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 4-foot long troffers (with 1, 2,

3, or 4 lamps) or 2-foot U-bent fixtures (with 2 lamps). Areas such as wrestling room and a few stairwell have been retrofitted with LED fixtures and lamps. The auxiliary gym utilizes high bay T5 linear tube fixtures to light the space.

Small areas such as office spaces, storage closets, entrance areas etc., are lit using compact fluorescents (13-watt, 26-watt and 42-watt with recessed fixtures) and incandescent bulbs (75-watt, 120-watt).

Lighting control in spaces is predominantly provided using wall switches. Some areas like the media center, few offices, closets, locker rooms and restrooms have occupancy sensors in the spaces to provide lighting control. The occupancy sensors are either wall or ceiling mounted depending on the space layout.

The building's exterior lighting is consists primarily of metal halide wall pack fixtures (70-watt, 175-watt and 250-watt) and pole mounted LED fixtures that are controlled by photocells and timers. Most EXIT signs in the building are 2-watt LED fixtures (except a few with fluorescent bulbs) and are kept ON throughout the year.

Image 2 Samples of various lighting fixtures at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Hot Water (or Steam) Heating System

The high school has two boiler rooms one serving the original section of the building and other serving the addition (500/600 wing added in 2003). The original section has four condensing hot water boilers from MACH (Model C4000) with an output capacity of 3800 MBh and an efficiency of 95%. The hot water is circulated through the building using (2) 20 hp VFD driven hot water pumps. These boilers were upgraded three years ago and are well maintained.

The newer section also has four condensing hot water boilers from AERCO with an output capacity of 1720 MBh and an efficiency 86%. The boiler water is circulated through the building using (2) 20 hp constant speed motors. These boilers are 14 years old, in good condition and well maintained.

The hot water from these boilers are supplied at 180°F when the outside air temperature is below 50°F and modulated to lower temperatures until the outside air is 65°F. Above this temperature, the boiler is shutdown. The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather.

The terminal units in the original section of the building include unit ventilators and baseboard heaters. These are controlled pneumatically but the controls were observed to be working improperly in a few sections of the building. The newer section (500/600 classrooms) have the vertical packaged unit (heating and cooling units) from Airdale. These have hot water coils fed from the boilers of the section and DX cooling with vents on top of the unit. The heat in the newer section have DDC controls provided by Honeywell. Other large spaces such as the gymnasium and auditorium are served using large rooftop heating, AC and ventilation systems which appear to be original to the building and are in poor condition.

Image 3 Boiler serving the two sections and samples of terminal units and controls

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Direct Expansion Air Conditioning System (DX)

The areas in the Montville high school that are provided cooling use equipment such as packaged unit (inside the rooms or rooftop), split AC units and window AC units. There are some areas of the school as the gymnasium and some storage areas that are not provided any cooling.

Bigger spaces such as auditorium, team rooms, wrestling room, locker rooms etc have DX packaged units on the roof that cools them. All of these units are controlled using DDC management system provided by Honeywell. The controls include the scheduling of these systems and temperature setpoints.

Many classrooms have their own window AC units. These are newer energy star rated units and have automatic controls and temperature control settings. Spaces such as the offices tech room etc are cooling using the split AC units. The split units are controlled by individual thermostats in the respective spaces.

It was mentioned by the site contact that the HVAC system is shut down during the end of June and remains shut down for the months of July and August.

Image 4 Different types of AC systems and controls in the school

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of two gas fired domestic hot water heaters provided by Lochinvar. These have an input capacity of 1000 MBh and a tank capacity of 300 gallons. The areas served by these are the restrooms, classrooms sinks, laboratories, team rooms and the kitchen areas. We suggest upgrading all hot water using fixtures to be low flow in order to reduce the consumption and hence reduce the load on the domestic hot water heater.

The water heater has an efficiency of 86% and the hot water is circulated to different parts of the school using two pumps of capacities 1 hp and 5 hp. The domestic hot water heater is 15 years old, in decent condition and well maintained.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Food Service & Refrigeration

The high school has fully equipped kitchen that prepares and serves meals for the students of the school. The kitchen operates between 6AM and 3PM. Most of the cooking equipment are gas fired including the convection ovens, steamers and burner stove/oven. The burner and the convection are used to do most of the cooking and also recommended to be replaced with a higher efficiency equipment. There is a commercial dishwasher with an electric booster.

The kitchen has two walk-in freezers and two walk-in refrigerators and several commercial reach-in refrigerators. Most kitchen equipment were observed to be in decent condition.

Image 5 Sample of existing kitchen equipment at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's food service and refrigeration equipment.

Building Plug Load

The high school plug accounts for roughly 3% of the total energy use in the school. There are approximately 249 computer work stations and 76 laptops throughout the facility. The students also have their individual chrome books and chrome book carts to charge them during school hours. Other plug load equipment in the school includes large number of printers (various sizes), smart boards, projectors, laundry equipment (washers and dryers) and televisions (CRT, LCD and LED).

There are also kitchenette equipment in the teachers' lounges and individual offices such as microwave ovens, coffee machines, water dispensers, counter top and mini refrigerators, toasters, toaster oven etc.

There is no centralized PC power management software installed.

There are 9 refrigerated vending machines in the facility without controls. We recommend occupancy based controls be installed on these as they power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

A sampling of restrooms and classrooms sinks found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

The school has a girls and boys locker room which were also identified to be 2.5 gpm.

Image 6 Sample of water using systems at the facility

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

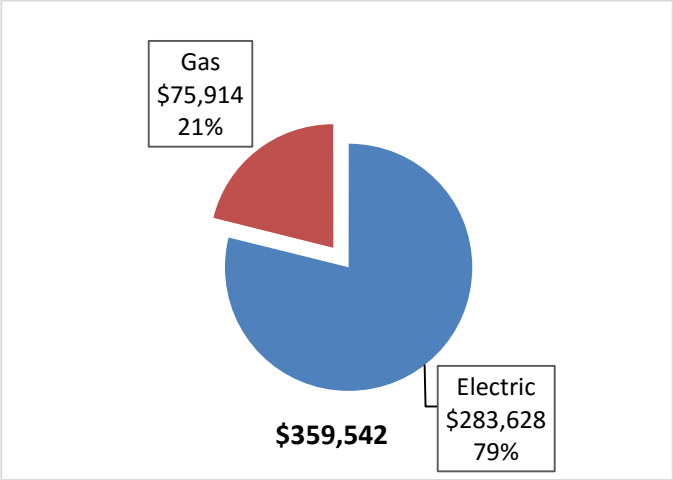
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Montville High School		
Fuel	Usage	Cost
Electricity	2,442,047 kWh	$283,628
Natural Gas	71,581 Therms	$75,914
Total		$359,542

The current annual energy cost for this facility is $359,542 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.116/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

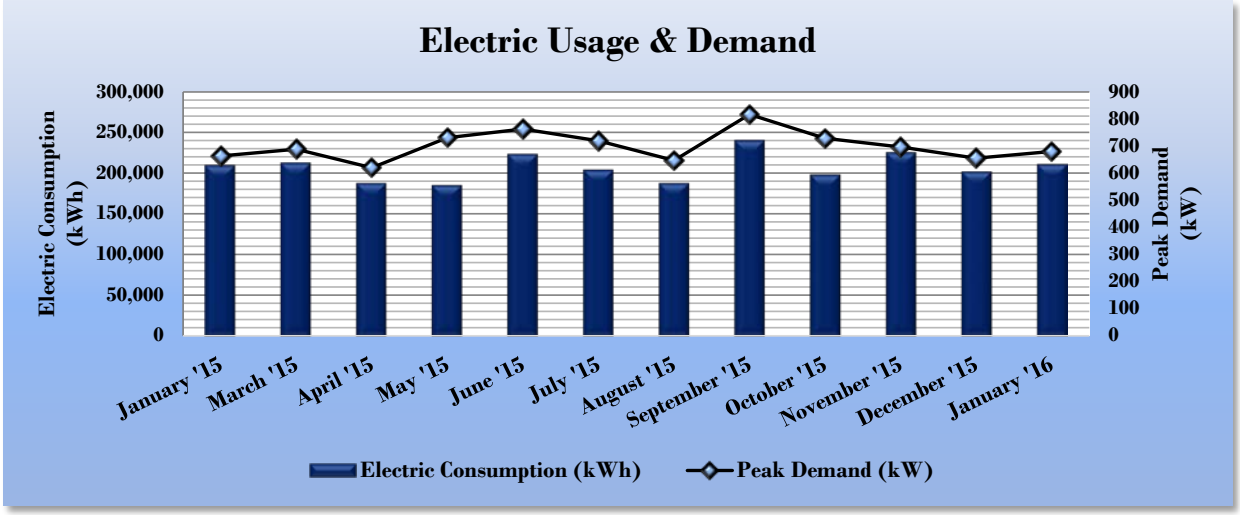


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Montville High School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/13/15	30	209,764	664	$3,493	$23,756
3/17/15	32	212,712	688	$3,588	$23,953
4/16/15	30	187,910	620	$3,572	$22,037
5/18/15	32	185,647	730	$3,929	$22,316
6/18/15	31	223,411	762	$4,402	$26,460
7/20/15	32	204,069	719	$4,140	$24,303
8/24/15	35	187,961	647	$3,171	$21,714
9/25/15	32	240,388	816	$4,686	$28,390
10/23/15	28	198,265	729	$3,919	$23,525
11/20/15	28	225,605	697	$3,450	$25,758
12/22/15	32	202,185	655	$2,996	$22,957
1/21/16	30	210,964	680	$3,084	$23,900
Totals	372	2,488,881	816.2	$44,429	$289,068
Annual	365	2,442,047	816.2	$43,593	$283,628

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.061/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

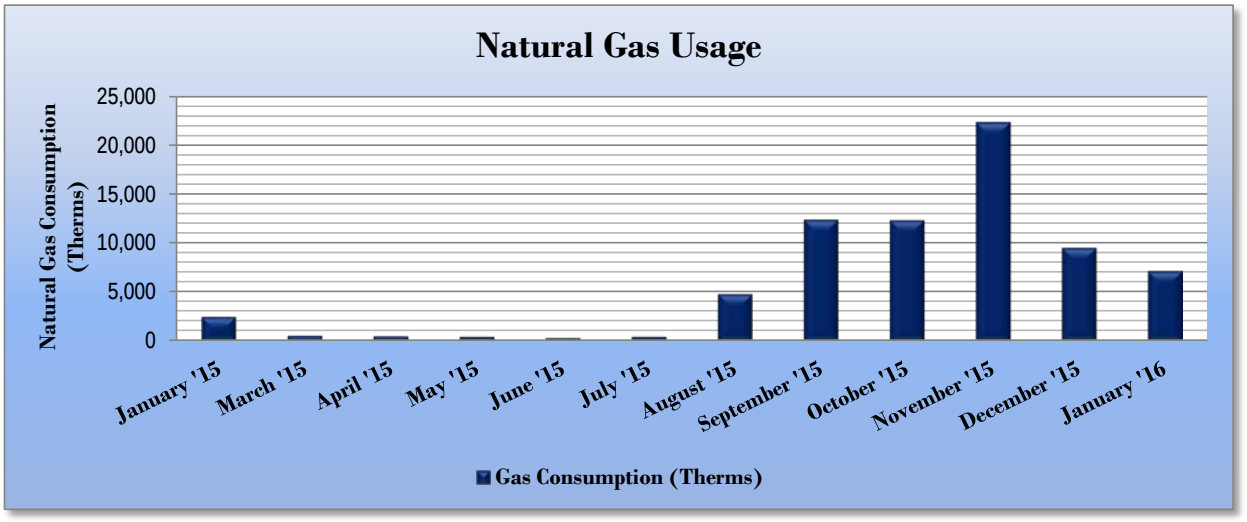


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Montville High School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/13/15	30	2,429	$3,574
3/17/15	32	508	$1,977
4/16/15	30	436	$1,931
5/18/15	32	392	$1,884
6/18/15	31	289	$1,798
7/20/15	32	387	$1,868
8/24/15	35	4,769	$5,313
9/25/15	32	12,392	$11,763
10/23/15	28	12,338	$11,415
11/20/15	28	22,377	$19,430
12/22/15	32	9,508	$9,164
1/21/16	30	7,128	$7,253
Totals	372	72,954	$77,370
Annual	365	71,581	$75,914

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Montville High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	158.4	141.4
Site Energy Use Intensity (kBtu/ft^2)	72.9	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Montville High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	132.6	141.4
Site Energy Use Intensity (kBtu/ft^2)	62.4	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 59.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

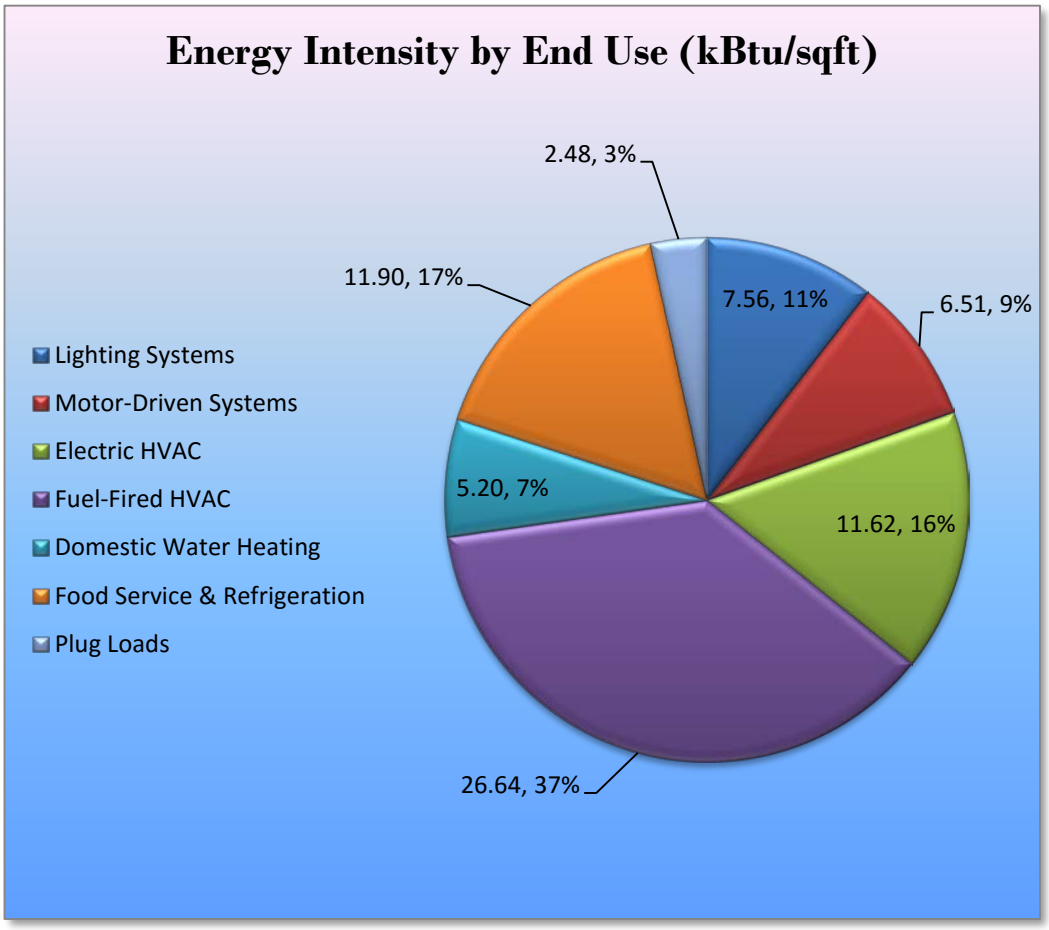
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Montville High School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		284,682	65.1	0.0	$33,063.97	$177,953.98	$29,460.00	$148,493.98	4.5	286,672
ECM 1	Install LED Fixtures	52,260	7.4	0.0	$6,069.69	$23,124.47	$4,390.00	$18,734.47	3.1	52,626
ECM 2	Retrofit Fixtures with LED Lamps	232,300	57.7	0.0	$26,980.23	$154,614.40	$25,070.00	$129,544.40	4.8	233,925
ECM 3	Install LED Exit Signs	121	0.0	0.0	$14.04	$215.11	$0.00	$215.11	15.3	122
Lighting Control Measures		32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858
ECM 4	Install Occupancy Sensor Lighting Controls	32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858
Variable Frequency Drive (VFD) Measures		81,252	13.2	0.0	$9,436.89	$34,290.55	$5,040.00	$29,250.55	3.1	81,820
ECM 5	Install VFDs on Constant Volume (CV) HVAC	33,922	8.4	0.0	$3,939.86	$21,621.95	$5,040.00	$16,581.95	4.2	34,159
ECM 6	Install VFDs on Hot Water Pumps	47,330	4.8	0.0	$5,497.04	$12,668.60	$0.00	$12,668.60	2.3	47,661
Electric Unitary HVAC Measures		22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583
ECM 7	Install High Efficiency Electric AC	22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583
HVAC System Improvements		7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214
ECM 8	Install Dual Enthalpy Outside Economizer Control	7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214
Domestic Water Heating Upgrade		0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927
Food Service Equipment & Refrigeration Measures		0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674
ECM 10	Food Service Equipment Replacement	0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674
Plug Load Equipment Control - Vending Machine		14,507	0.0	0.0	$1,684.85	$2,070.00	$0.00	$2,070.00	1.2	14,608
ECM 11	Vending Machine Control	14,507	0.0	0.0	$1,684.85	$2,070.00	$0.00	$2,070.00	1.2	14,608
TOTALS		442,660	101.8	714.0	$58,984.40	$350,203.29	$44,770.00	$305,433.29	5.2	529,356

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		284,682	65.1	0.0	$33,063.97	$177,953.98	$29,460.00	$148,493.98	4.5	286,672
ECM 1	Install LED Fixtures	52,260	7.4	0.0	$6,069.69	$23,124.47	$4,390.00	$18,734.47	3.1	52,626
ECM 2	Retrofit Fixtures with LED Lamps	232,300	57.7	0.0	$26,980.23	$154,614.40	$25,070.00	$129,544.40	4.8	233,925
ECM 3	Install LED Exit Signs	121	0.0	0.0	$14.04	$215.11	$0.00	$215.11	15.3	122

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	22,099	3.5	0.0	$2,566.62	$2,685.20	$150.00	$2,535.20	1.0	22,253
Exterior	30,162	3.9	0.0	$3,503.07	$20,439.27	$4,240.00	$16,199.27	4.6	30,372

Measure Description

We recommend replacing existing fixtures containing HID lamps on the metal halide wall pack fixtures on the building exterior with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	223,325	56.5	0.0	$25,937.74	$147,568.99	$25,070.00	$122,498.99	4.7	224,886
Exterior	8,976	1.2	0.0	$1,042.50	$7,045.42	$0.00	$7,045.42	6.8	9,039

Measure Description

We recommend retrofitting existing incandescent, and linear T8 tubes with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 3: Install LED EXIT Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	121	0.0	0.0	$14.04	$215.11	$0.00	$215.11	15.3	122
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all compact fluorescent EXIT signs with LED EXIT signs. LED EXIT signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858
ECM 4	Install Occupancy Sensor Lighting Controls	32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
32,629	9.4	0.0	$3,789.70	$28,908.00	$4,060.00	$24,848.00	6.6	32,858

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, classrooms and offices areas etc. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		81,252	13.2	0.0	$9,436.89	$34,290.55	$5,040.00	$29,250.55	3.1	81,820
ECM 5	Install VFDs on Constant Volume (CV) HVAC	33,922	8.4	0.0	$3,939.86	$21,621.95	$5,040.00	$16,581.95	4.2	34,159
ECM 6	Install VFDs on Hot Water Pumps	47,330	4.8	0.0	$5,497.04	$12,668.60	$0.00	$12,668.60	2.3	47,661

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about current motors systems and VFD recommendations.

ECM 5: Install VFDs on Constant Volume (CV) HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
33,922	8.4	0.0	$3,939.86	$21,621.95	$5,040.00	$16,581.95	4.2	34,159

Measure Description

We recommend installing variable frequency drives (VFDs) on the supply fan motors of the air handlers serving the gym and the hallways to control the fan motor speeds to convert a constant-volume, single-zone air handling system into a variable volume system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

ECM 6: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
47,330	4.8	0.0	$5,497.04	$12,668.60	$0.00	$12,668.60	2.3	47,661

Measure Description

We recommend installing a variable frequency drives (VFD) to control a 20 hp hot water pumps of the new section boiler room. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 19 below.

Figure 19 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583
ECM 7	Install High Efficiency Electric AC	22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about existing HVAC equipment and proposed upgrades.

ECM 7: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
22,426	12.5	0.0	$2,604.65	$60,054.98	$2,960.00	$57,094.98	21.9	22,583

Measure Description

We recommend replacing standard efficiency 20 ton packaged air conditioning unit with high efficiency packaged air conditioning units in the Library and room 418 as they have come to the end of their useful life. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

4.1.5 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 20 below.

Figure 20 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214
ECM 8	Install Dual Enthalpy Outside Economizer Control	7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214

ECM 8: Install Dual-Enthalpy Economizers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
7,164	1.6	0.0	$832.09	$1,400.00	$500.00	$900.00	1.1	7,214

Measure Description

Dual enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of

running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy. As most of the high efficiency packaged units manufactured these days come with inbuilt economizers, we recommend that the packaged unit that replaces the existing ones in the library and room 418 include enthalpy economizers too.

We recommend installing dual enthalpy economizers in the (2) 20 ton packaged units serving the Library and Room 418. Please note that, upon replacing the AC units serving these areas with new higher efficiency units, there is an option to have dual-enthalpy economizers installed on them. If the units are not replaced, then it is possible to install the economizers on the existing units.

Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

4.1.6 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 21 below.

Figure 21 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 9: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	110.4	$1,170.85	$451.71	$0.00	$451.71	0.4	12,927

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.7 Food Service Equipment & Refrigeration Measures

Food service and refrigeration measures recommendations are summarized in Figure 22 below.

Figure 22 - Summary of Food Service Equipment & Refrigeration ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Food Service Equipment & Refrigeration Measures		0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674
ECM 10	Food Service Equipment Replacement	0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing food service and refrigeration and our recommended measures for this category.

ECM 10: Food Service Equipment Replacement

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	603.6	$6,401.40	$45,074.06	$2,750.00	$42,324.06	6.6	70,674

We recommend replacement of the existing gas fired convection oven and burner stove with new high efficiency equipment as these equipment are used the most in preparing food at the school. Buildings that use a lot of food service equipment are often among the most energy intensive commercial buildings. Energy usage in commercial kitchens is primarily used for cooking and refrigeration. There have been many energy efficiency improvements for cooking, dishwashing, and refrigerated food storage. For more information on improved energy efficiency for food service and storage see the Food Service Technology Center website at: www.fishnick.com.

4.1.8 Plug Load Equipment Control - Vending Machines

ECM 11: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
14,507	0.0	0.0	$1,684.85	$2,070.00	$0.00	$2,070.00	1.2	14,608

Measure Description

Vending machines in the teachers' lounges and team rooms operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These

controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.6 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

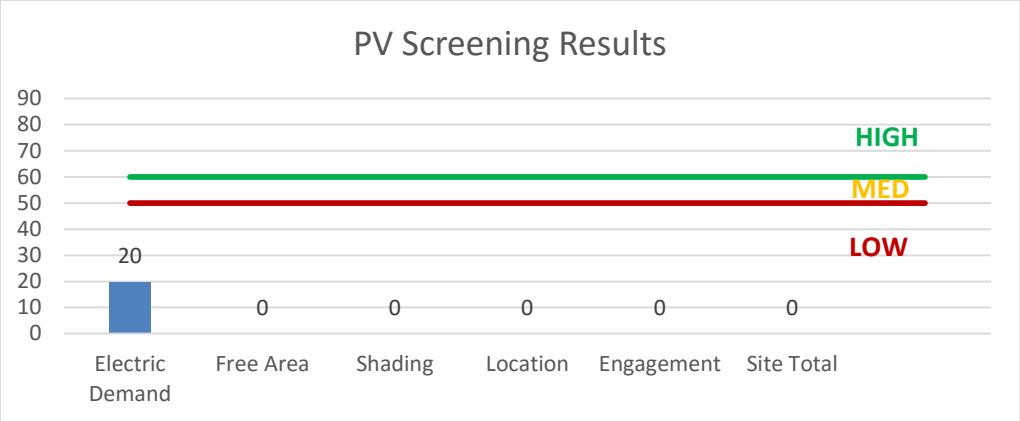
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a Low potential for installing a PV array.

The facility already has an existing solar PV system on the roof. However, the audit evaluated the prospects of an expansion of the existing system. As all of the major HVAC equipment are placed in the roof there is very less scope for expanding the solar system. However, if Montville High School is interested in pursuing an expansion project, we recommend a full feasibility study be conducted.

Figure 23 - Photovoltaic Screening



Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 25 for a list of the eligible programs identified for each recommended ECM.

Figure 244 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	x			x
ECM 2	Retrofit Fixtures with LED Lamps	x			x
ECM 3	Install LED Exit Signs				x
ECM 4	Install Occupancy Sensor Lighting Controls				x
ECM 5	Install VFDs on Constant Volume (CV) HVAC	x			x
ECM 6	Install VFDs on Hot Water Pumps		x		x
ECM 7	Install High Efficiency Electric AC	x			x
ECM 8	Install Dual Enthalpy Outside Economizer Control				x
ECM 9	Install Low-Flow Domestic Hot Water Devices				x
ECM 10	Food Service Equipment Replacement	x			x
ECM 11	Vending Machine Control				x

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing *prescriptive* and *custom* energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the SS custom program provides incentives for new and innovative technologies, or process improvements not defined through one of the prescriptive incentives listed above.

Although your facility is an existing building, and only the prescriptive incentives have been applied in the calculations, the SS custom measure path is recommended for ECM 4 (Install VFDs on Well Pumps). These incentives are calculated utilizing a number of factors, including project cost, energy savings and comparison to existing conditions or a defined standard. To qualify, the proposed measure(s) must be at least 2% more efficient than current energy code or recognized industry standard, and save at least 75,000 kWh or 1,500 therms annually.

SS custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives in the SS program (inclusive of prescriptive and custom) are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SS prescriptive program you will need to submit an application for the specific equipment installed or to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in

this report. Please note that SS custom application requirements are different from the prescriptive applications and will most likely require additional effort to complete.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.10/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure

of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main office	19	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	19	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.36	1,318	0.0	$153.08	$1,200.80	$0.00	7.84
Principal's office	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.25	930	0.0	$108.07	$748.00	$20.00	6.74
Supervisor - Performing Arts	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.10	372	0.0	$43.23	$368.80	$20.00	8.07
Supervisor - World language	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.08	279	0.0	$32.42	$305.60	$20.00	8.81
School Nurse	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	8	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.15	470	0.0	$54.54	$505.60	$0.00	9.27
Lavatory	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	546	0.10	140	0.0	$16.21	$368.80	$20.00	21.52
Lavatory	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	546	0.03	35	0.0	$4.05	$179.20	$20.00	39.28
Custodial closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	156	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	156	0.02	5	0.0	$0.60	$63.20	$0.00	104.59
Hallway	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.11	416	0.0	$48.34	$379.20	$0.00	7.84
Hallway	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	5	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.10	347	0.0	$40.28	$316.00	$0.00	7.84
Office education tech	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.10	372	0.0	$43.23	$368.80	$20.00	8.07
Office - supervisor	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.08	279	0.0	$32.42	$305.60	$20.00	8.81
Office - supervisor	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.08	279	0.0	$32.42	$305.60	$20.00	8.81
Office 214	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.10	372	0.0	$43.23	$368.80	$20.00	8.07
Office 213	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,456	0.10	372	0.0	$43.23	$368.80	$20.00	8.07
Hallway	64	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	64	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,608	1.22	7,701	0.0	$894.41	$4,044.80	$0.00	4.52
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.28	1,780	0.0	$206.74	$760.50	$130.00	3.05
School store	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.09	267	0.0	$31.03	$234.00	$40.00	6.25
200 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.11	399	0.0	$46.34	$350.00	$60.00	6.26
Women's restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.16	224	0.0	$26.07	$467.00	$80.00	14.85
Men's restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.16	224	0.0	$26.07	$467.00	$80.00	14.85
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.09	548	0.0	$63.61	$234.00	$40.00	3.05
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$7.76	$58.50	$10.00	6.25
Custodian office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	156	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	156	0.06	18	0.0	$2.06	$175.50	$30.00	70.54
Lavatory	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.03	37	0.0	$4.34	$174.50	$30.00	33.26

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Media center	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.39	1,421	0.0	$165.02	$1,053.00	$180.00	5.29
Media center	82	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	82	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	1.77	6,473	0.0	$751.77	$4,797.00	$820.00	5.29
Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.32	2,054	0.0	$238.54	$877.50	$150.00	3.05
Tech hub	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.17	631	0.0	$73.34	$468.00	$80.00	5.29
Electrical panel	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	260	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	260	0.04	20	0.0	$2.29	$117.00	$20.00	42.32
Women's restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.16	224	0.0	$26.07	$467.00	$80.00	14.85
Men's restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.16	224	0.0	$26.07	$467.00	$80.00	14.85
Staff restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.03	37	0.0	$4.34	$174.50	$30.00	33.26
Staff restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.03	37	0.0	$4.34	$174.50	$30.00	33.26
Main office	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Media center	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.37	2,328	0.0	$270.35	$994.50	$170.00	3.05
CR 301,302,304,303,306,305, 308,307	96	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	96	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	2.62	8,102	0.0	$941.05	$7,776.00	$1,240.00	6.95
Office 330	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.33	1,197	0.0	$139.02	$972.00	$155.00	5.88
CR 309	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.38	1,182	0.0	$137.24	$1,089.00	$175.00	6.66
Hallway	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.43	2,738	0.0	$318.06	$1,170.00	$200.00	3.05
CR 310	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
CR 311	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
CR 312	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
office 341 A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.04	158	0.0	$18.34	$117.00	$20.00	5.29
CR 313	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
CR 314	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.44	1,350	0.0	$156.84	$1,206.00	$195.00	6.45
Custodial closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$7.76	$58.50	$10.00	6.25
Hallway	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.39	2,465	0.0	$286.25	$1,053.00	$180.00	3.05

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
office 341	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,526	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.04	192	0.0	$22.26	$117.00	$20.00	4.36
Office 315 A, B, C , E	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.38	2,422	0.0	$281.34	$1,283.00	$220.00	3.78
Office 316	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.08	519	0.0	$60.29	$291.50	$50.00	4.01
Office 316 A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.05	346	0.0	$40.19	$233.00	$40.00	4.80
Office 316 D	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.05	346	0.0	$40.19	$233.00	$40.00	4.80
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.16	1,038	0.0	$120.57	$467.00	$80.00	3.21
Office 317 B	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.05	346	0.0	$40.19	$233.00	$40.00	4.80
Office 317 F	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.05	346	0.0	$40.19	$233.00	$40.00	4.80
Office 317 C	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.05	346	0.0	$40.19	$233.00	$40.00	4.80
Office 317 E	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.05	346	0.0	$40.19	$233.00	$40.00	4.80
Office	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.25	1,557	0.0	$180.86	$642.50	$110.00	2.94
CR 319	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.22	675	0.0	$78.42	$584.00	$100.00	6.17
CR 318	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$818.00	$140.00	5.76
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.26	1,643	0.0	$190.83	$702.00	$120.00	3.05
Boiler Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.26	1,643	0.0	$190.83	$702.00	$120.00	3.05
CR 511 - Arts	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.82	5,191	0.0	$602.86	$2,025.00	$335.00	2.80
Photography 509	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	22	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.48	3,012	0.0	$349.86	$1,287.00	$220.00	3.05
Storage closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	156	0.02	6	0.0	$0.69	$58.50	$10.00	70.54
Office 341	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,608	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.02	105	0.0	$12.24	$233.00	$40.00	15.77
Photography 509	2	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	13	3,608	Relamp	No	2	LED Screw-In Lamps: Wall mount fixture - 1 lamp	Wall Switch	4	3,608	0.01	75	0.0	$8.67	$87.91	$0.00	10.13
Hallway	9	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	9	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office 316 D	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 511 - Arts	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 500	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 501	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.22	1,369	0.0	$159.03	$585.00	$100.00	3.05
CR 502	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
CR 503	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$972.00	$155.00	6.95
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.15	958	0.0	$111.32	$409.50	$70.00	3.05
CR 518	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.16	506	0.0	$58.82	$467.00	$80.00	6.58
Electrical closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	260	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	260	0.06	30	0.0	$3.44	$175.50	$30.00	42.32
CR 505	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.38	1,182	0.0	$137.24	$935.00	$160.00	5.65
CR 506	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.44	1,350	0.0	$156.84	$1,052.00	$180.00	5.56
Men's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.05	75	0.0	$8.69	$233.00	$40.00	22.21
Men's restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.01	11	0.0	$1.32	$174.50	$30.00	109.21
Women's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.05	75	0.0	$8.69	$233.00	$40.00	22.21
Art studio 507	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.35	1,069	0.0	$124.12	$936.00	$160.00	6.25
Room 508	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$176.45	$1,169.00	$200.00	5.49
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.15	958	0.0	$111.32	$409.50	$70.00	3.05
Room 514	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.16	506	0.0	$58.82	$467.00	$80.00	6.58
Room 513	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.16	506	0.0	$58.82	$467.00	$80.00	6.58
IT closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.04	39	0.0	$4.58	$117.00	$20.00	21.16
Custodial closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	156	0.02	6	0.0	$0.69	$58.50	$10.00	70.54
Elevator light	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.02	137	0.0	$15.90	$58.50	$10.00	3.05
CR 607	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.55	1,688	0.0	$196.05	$1,440.00	$235.00	6.15
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.15	958	0.0	$111.32	$409.50	$70.00	3.05
Electrical closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.04	39	0.0	$4.58	$117.00	$20.00	21.16
CR 604	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.55	1,688	0.0	$196.05	$1,440.00	$235.00	6.15
CR 618	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.19	591	0.0	$68.62	$525.50	$90.00	6.35

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.15	958	0.0	$111.32	$409.50	$70.00	3.05
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,608	0.06	411	0.0	$47.71	$150.40	$30.00	2.52
CR 603	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.66	2,026	0.0	$235.26	$1,674.00	$275.00	5.95
CR 602	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.44	1,350	0.0	$156.84	$1,206.00	$195.00	6.45
Prep room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.06	200	0.0	$23.27	$175.50	$30.00	6.25
Chemistry lab 600	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.66	2,026	0.0	$235.26	$1,674.00	$275.00	5.95
IT closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.02	137	0.0	$15.90	$58.50	$10.00	3.05
Men's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	780	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	546	0.03	39	0.0	$4.55	$187.80	$30.00	34.66
Men's restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	546	0.01	19	0.0	$2.20	$164.20	$30.00	61.05
Women's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	780	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	546	0.03	39	0.0	$4.55	$187.80	$30.00	34.66
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.15	958	0.0	$111.32	$409.50	$70.00	3.05
CR 608	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.52	1,604	0.0	$186.25	$1,381.50	$225.00	6.21
615 office	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.30	1,097	0.0	$127.43	$759.50	$130.00	4.94
CR 610	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.44	1,350	0.0	$156.84	$1,206.00	$195.00	6.45
CR 611	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.66	2,026	0.0	$235.26	$1,674.00	$275.00	5.95
CR 612	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.44	1,350	0.0	$156.84	$1,206.00	$195.00	6.45
Prep room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.06	200	0.0	$23.27	$175.50	$30.00	6.25
CR 614	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.66	2,026	0.0	$235.26	$1,674.00	$275.00	5.95
CR 602	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	1,760	Relamp	Yes	1	LED Screw-In Lamps: Recessed fixture - 1 lamp	Occupancy Sensor	7	1,232	0.01	43	0.0	$4.96	$169.75	$20.00	30.19
Prep room	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	1,760	Relamp	No	1	LED Screw-In Lamps: Recessed fixture - 1 lamp	Wall Switch	7	1,760	0.01	38	0.0	$4.47	$53.75	$0.00	12.03
Stairwell	8	Compact Fluorescent: Recessed fixture - 2 lamp	Wall Switch	42	4,380	Relamp	No	8	LED Screw-In Lamps: Recessed fixture - 2 lamp	Wall Switch	11	4,380	0.16	1,249	0.0	$145.08	$860.05	$0.00	5.93
Hallway	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's restroom	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Women's restroom	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 344	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,526	0.11	692	0.0	$80.38	$350.00	$60.00	3.61

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.30	1,917	0.0	$222.64	$819.00	$140.00	3.05
Cafeteria	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,526	1.97	12,458	0.0	$1,446.87	$4,689.60	$860.00	2.65
Kitchen office	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	19	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.41	952	0.0	$110.54	$1,111.50	$190.00	8.34
Kitchen office	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.26	601	0.0	$69.82	$702.00	$120.00	8.34
Kitchen office	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,320	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,320	0.02	49	0.0	$5.64	$96.40	$20.00	13.54
Teacher's lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	3,608	Relamp	Yes	4	LED - Linear Tubes: (6) 4' Lamps	Occupancy Sensor	87	2,526	0.30	1,910	0.0	$221.87	$652.89	$140.00	2.31
Women's locker room	24	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	780	Relamp	Yes	24	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	546	0.34	470	0.0	$54.63	$1,401.60	$190.00	22.18
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,760	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,760	0.09	267	0.0	$31.03	$234.00	$40.00	6.25
Gym	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.09	548	0.0	$63.61	$234.00	$40.00	3.05
Men's locker room	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.63	860	0.0	$99.92	$1,885.50	$300.00	15.87
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.08	112	0.0	$13.03	$445.50	$65.00	29.20
Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	780	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	546	0.06	78	0.0	$9.11	$413.60	$55.00	39.38
Coach's office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,760	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,232	0.03	88	0.0	$10.27	$341.80	$45.00	28.89
Locker room	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	780	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	546	0.09	118	0.0	$13.66	$485.40	$65.00	30.78
Football locker room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.22	299	0.0	$34.75	$738.00	$115.00	17.93
Storage	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	204	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	204	0.11	39	0.0	$4.50	$292.50	$50.00	53.94
Gym	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.17	1,095	0.0	$127.22	$468.00	$80.00	3.05
Closet	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.11	148	0.0	$17.19	$292.50	$50.00	14.11
Physical therapy	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,760	0.26	802	0.0	$93.09	$601.60	$120.00	5.17
AD's office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,608	0.19	1,232	0.0	$143.13	$451.20	$90.00	2.52
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	No	13	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,608	0.42	2,670	0.0	$310.10	$977.60	$195.00	2.52
Electrical closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	156	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	156	0.03	9	0.0	$1.03	$75.20	$15.00	58.37
Women's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	780	0.03	44	0.0	$5.16	$75.20	$15.00	11.67
Men's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	780	0.03	44	0.0	$5.16	$75.20	$15.00	11.67
Hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	0.16	592	0.0	$68.76	$376.00	$75.00	4.38

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Girl's locker room	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	780	0.29	400	0.0	$46.41	$676.80	$135.00	11.67
Office 046	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	0.13	474	0.0	$55.01	$300.80	$60.00	4.38
Office 046	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,080	Relamp	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,080	0.02	65	0.0	$7.50	$63.80	$10.00	7.17
Cafeteria	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.52	3,286	0.0	$381.67	$1,404.00	$240.00	3.05
Kitchen	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Locker room	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	Yes	8	Exit Signs: LED - 2 W Lamp	Occupancy Sensor	6	6,132	0.01	145	0.0	$16.85	$270.00	$35.00	13.95
Custodial closet	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
AD's office	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical closet	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	1	Incandescent: Recessed fixture - 1 lamp	Occupancy Sensor	120	2,526	Relamp	No	1	LED Screw-In Lamps: Incandescent recessed fixture - 1 lamp	Occupancy Sensor	14	2,526	0.07	308	0.0	$35.76	$78.25	$5.00	2.05
Custodial closet	1	Incandescent: Recessed fixture - 1 lamp	Occupancy Sensor	120	2,526	Relamp	No	1	LED Screw-In Lamps: Incandescent recessed fixture - 1 lamp	Occupancy Sensor	14	2,526	0.07	308	0.0	$35.76	$78.25	$5.00	2.05
Gym	25	Metal Halide: (1) 175W Lamp	Wall Switch	215	3,608	Fixture Replacement	No	1	LED - Fixtures: High-Bay	Wall Switch	49	3,608	3.49	22,099	0.0	$2,566.62	$2,685.20	$150.00	0.99
Gym 2	20	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	3,608	Relamp	No	20	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,608	0.81	5,145	0.0	$597.56	$1,902.67	$400.00	2.51
Coach's office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,608	0.19	1,232	0.0	$143.13	$451.20	$90.00	2.52
Wrestling room	10	LED - Fixtures: High-Bay	Wall Switch	50	3,608	None	No	10	LED - Fixtures: High-Bay	Wall Switch	50	3,608	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Wrestling room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.11	685	0.0	$79.51	$292.50	$50.00	3.05
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.06	411	0.0	$47.71	$175.50	$30.00	3.05
Stage	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.35	2,191	0.0	$254.45	$936.00	$160.00	3.05
Stage	23	Halogen Incandescent: Recessed fixture - 1 lamp	Wall Switch	120	3,608	None	No	23	Halogen Incandescent: Recessed fixture - 1 lamp	Wall Switch	120	3,608	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stage	12	Incandescent: Wall mount fixture - 1 lamp	Wall Switch	25	3,608	None	No	12	Incandescent: Wall mount fixture - 1 lamp	Wall Switch	25	3,608	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.28	1,026	0.0	$119.18	$760.50	$130.00	5.29
CR 100	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.33	1,013	0.0	$117.63	$818.00	$140.00	5.76

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Custodial closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	156	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	109	0.04	12	0.0	$1.37	$223.70	$35.00	138.16
Weights room	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.98	3,591	0.0	$417.06	$2,074.80	$395.00	4.03
Weights room	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,080	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,456	0.01	50	0.0	$5.86	$164.20	$30.00	22.89
CR 101	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$176.45	$1,018.40	$200.00	4.64
Faculty Men's restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.08	112	0.0	$13.03	$291.50	$50.00	18.53
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	204	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	204	0.06	23	0.0	$2.70	$175.50	$30.00	53.94
CR 103	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,319.20	$260.00	4.50
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.19	1,232	0.0	$143.13	$526.50	$90.00	3.05
CR 104	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,319.20	$260.00	4.50
Orchestra - 106	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.41	1,266	0.0	$147.04	$1,022.00	$185.00	5.69
Wood shop 105	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	32	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.69	1,069	0.0	$124.12	$1,872.00	$320.00	12.50
Vocal music 108	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	616	0.33	506	0.0	$58.82	$972.00	$155.00	13.89
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.15	958	0.0	$111.32	$409.50	$70.00	3.05
CR 113	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$176.45	$1,018.40	$200.00	4.64
CR 112	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.66	2,026	0.0	$235.26	$1,520.00	$260.00	5.36
CAD Design 111	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.43	1,336	0.0	$155.15	$1,170.00	$200.00	6.25
110 - tech hub	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.09	267	0.0	$31.03	$234.00	$40.00	6.25
CR 107	21	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	Yes	21	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	1.01	3,120	0.0	$362.34	$2,113.80	$440.00	4.62
CR 107	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$15.51	$117.00	$20.00	6.25
Music room 109	35	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	No	35	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,760	1.28	3,967	0.0	$460.75	$3,329.67	$700.00	5.71
Music room 109	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,760	0.16	501	0.0	$58.18	$376.00	$75.00	5.17
Music room 109	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.11	334	0.0	$38.79	$292.50	$50.00	6.25
Boiler Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.22	1,369	0.0	$159.03	$585.00	$100.00	3.05
Auditorium backstage	7	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	520	Relamp	No	7	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	520	0.08	73	0.0	$8.51	$251.30	$35.00	25.42
Gym 2	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Coach's office	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stage	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Weights room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 103	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Vocal music 108	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 112	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CAD Design 111	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Music room 109	2	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	121	0.0	$14.04	$215.11	$0.00	15.32
Stairwell	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 422	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,526	0.66	4,153	0.0	$482.29	$1,473.20	$275.00	2.48
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,380	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,066	0.45	3,466	0.0	$402.52	$1,097.20	$200.00	2.23
Women's restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.16	224	0.0	$26.07	$621.00	$95.00	20.18
Women's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.02	30	0.0	$3.44	$58.50	$10.00	14.11
Men's restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.16	224	0.0	$26.07	$621.00	$95.00	20.18
Men's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.02	30	0.0	$3.44	$58.50	$10.00	14.11
CR 401	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.74	2,279	0.0	$264.67	$1,623.60	$305.00	4.98
Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,608	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,608	0.35	2,191	0.0	$254.45	$936.00	$160.00	3.05
CR 402	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.53	1,646	0.0	$191.15	$1,247.60	$230.00	5.32
CR 403	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.41	1,266	0.0	$147.04	$1,022.00	$185.00	5.69
Special ED offices 433	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,526	0.16	1,038	0.0	$120.57	$570.80	$95.00	3.95
Math lab 404	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,473.20	$275.00	5.09
CR 405	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.53	1,646	0.0	$191.15	$1,247.60	$230.00	5.32
CR 406	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,473.20	$275.00	5.09

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 407	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.41	1,266	0.0	$147.04	$1,022.00	$185.00	5.69
CR 407	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.16	506	0.0	$58.82	$570.80	$95.00	8.09
CR 408 - World language	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,473.20	$275.00	5.09
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,380	Relamp	No	11	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,380	0.36	2,743	0.0	$318.54	$827.20	$165.00	2.08
CR 409	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.33	1,013	0.0	$117.63	$871.60	$155.00	6.09
CR 410	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$176.45	$1,172.40	$215.00	5.43
CR 411	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$176.45	$1,172.40	$215.00	5.43
CR 430	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$88.22	$721.20	$125.00	6.76
CR 412	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.62	1,899	0.0	$220.56	$1,398.00	$260.00	5.16
Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,380	Relamp	No	16	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,380	0.52	3,989	0.0	$463.33	$1,203.20	$240.00	2.08
CR 413	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,473.20	$275.00	5.09
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	156	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	156	0.01	3	0.0	$0.36	$35.90	$5.00	84.74
Stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	4,380	Relamp	No	4	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	4,380	0.23	1,793	0.0	$208.27	$536.89	$120.00	2.00
CR 414	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$88.22	$721.20	$125.00	6.76
CR 415	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,473.20	$275.00	5.09
CR 414	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.33	1,013	0.0	$117.63	$871.60	$155.00	6.09
office 418 A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.16	506	0.0	$58.82	$570.80	$95.00	8.09
Office 418	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.82	2,532	0.0	$294.08	$1,774.00	$335.00	4.89
CR 416	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.82	2,532	0.0	$294.08	$1,774.00	$335.00	4.89
CR 417	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.62	1,899	0.0	$220.56	$1,398.00	$260.00	5.16
CR 417	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.01	26	0.0	$2.99	$328.50	$45.00	94.96
CR 414 C	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$88.22	$721.20	$125.00	6.76
Stairwell	8	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	4,380	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,380	0.05	383	0.0	$44.46	$601.60	$120.00	10.83
CR 419 - Math lab	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$176.45	$1,172.40	$215.00	5.43
Office 442	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$88.22	$567.20	$110.00	5.18

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 420	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.62	1,899	0.0	$220.56	$1,398.00	$260.00	5.16
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,608	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,526	0.45	2,855	0.0	$331.57	$1,097.20	$200.00	2.71
CR 421	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.66	2,026	0.0	$235.26	$1,473.20	$275.00	5.09
Room 439	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.16	506	0.0	$58.82	$467.00	$80.00	6.58
Stairwell	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	28	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.61	4,654	0.0	$540.55	$1,638.00	$280.00	2.51
Garage	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	27	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.58	533	0.0	$61.88	$1,579.50	$270.00	21.16
Entrance	6	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	42	4,380	Relamp	No	6	LED Screw-In Lamps: Recessed fixture - 1 lamp	Wall Switch	9	4,380	0.13	997	0.0	$115.83	$587.12	$0.00	5.07
Parking pole with 2 fixtures	24	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	60	4,380	None	No	24	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	60	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking pole - 1 fixture	11	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	30	4,380	None	No	11	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	30	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Focus fixture towards building	8	Metal Halide: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	8	LED - Fixtures: Track or Mono-Point Directional Lighting Fixtures	Wall Switch	141	4,380	0.81	6,206	0.0	$720.74	$4,812.19	$240.00	6.34
Wall pack fixtures	21	Metal Halide: (1) 175W Lamp	Wall Switch	215	4,380	Fixture Replacement	No	21	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	89	4,380	1.73	13,328	0.0	$1,547.95	$8,204.22	$2,100.00	3.94
Green pole fixtures	15	Metal Halide: (1) 175W Lamp	Wall Switch	215	4,380	Fixture Replacement	No	15	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	89	4,380	1.24	9,520	0.0	$1,105.68	$5,860.16	$1,500.00	3.94
Recessed fixtures @ doors	4	Metal Halide: (1) 70W Lamp	Wall Switch	95	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	40	4,380	0.14	1,108	0.0	$128.70	$1,562.71	$400.00	9.03
Recessed fixtures @ doors	66	Compact Fluorescent: 1 lamp	Wall Switch	32	4,380	Relamp	No	66	LED Screw-In Lamps: 1 lamo	Wall Switch	8	4,380	1.04	7,979	0.0	$926.67	$6,458.30	$0.00	6.97

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gym MER	AHU	1	Supply Fan	30.0	91.5%	No	4,067	No	91.5%	Yes	1	3.96	17,905	0.0	$2,079.61	$8,472.05	$2,400.00	2.92
Penthouse MER	AHU	2	Supply Fan	5.0	87.5%	No	3,120	No	87.5%	Yes	1	1.38	4,788	0.0	$556.10	$3,807.95	$800.00	5.41
Hallway room attic	AHU	1	Supply Fan	3.0	87.5%	No	3,120	No	87.5%	Yes	1	0.41	1,436	0.0	$166.83	$3,007.65	$240.00	16.59
Boiler room	Boiler	2	Heating Hot Water Pump	20.0	93.0%	No	3,391	No	93.0%	Yes	2	4.84	47,330	0.0	$5,497.04	$12,668.60	$0.00	2.30
Unit ventilators	Airedale	20	Supply Fan	0.3	58.0%	No	3,120	No	58.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Unit ventilators	Airedale	20	Supply Fan	1.0	85.5%	No	3,120	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Auditorium MER	AHU	1	Supply Fan	20.0	93.0%	No	3,391	No	93.0%	Yes	1	2.60	9,792	0.0	$1,137.32	$6,334.30	$1,600.00	4.16
Penthouse MER	AHU	1	Supply Fan	7.5	91.7%	No	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Boiler	2	Heating Hot Water Pump	20.0	93.0%	Yes	3,391	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	DHW	1	Water Supply Pump	1.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	DHW	1	Water Supply Pump	5.0	87.5%	Yes	2,745	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Air compressor	2	Air Compressor	3.0	87.5%	No	4,957	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator rooms	Elevator	1	Other	20.0	93.0%	No	3,391	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Gym - HVV unit	1	Supply Fan	3.0	87.5%	No	3,120	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Exhausts	30	Exhaust Fan	0.5	58.0%	No	4,380	No	58.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Unit ventilators	horizontal - original section	30	Supply Fan	0.3	58.0%	No	2,745	No	58.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
office, CR 301,302,309,310,319	office, CR 301,302,309,310,319	6	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Custodian room	Custodian room	1	Split-System AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Condenser outside	Office	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	High School	20	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Various	10	Packaged AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 7	Auditorium	1	Packaged AC	36.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Auditorium	1	Packaged AC	26.70		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Main office	1	Packaged AC	15.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Tech room	2	Split-System AC	5.00		Yes	2	Split-System AC	5.00		14.00		No	5.42	10,524	0.0	$1,222.27	$14,962.20	$920.00	11.49
RTU - 19,22,14,15,16,17,18	Team room	7	Packaged AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU - 20,21	Team room	2	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 23	Wrestling room	1	Packaged AC	15.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 12	Gym	1	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU-Chorus	Chorus room	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 13	Drawing room	1	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 12,11,10	Year book room, TV/Video Room	3	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU - 6,7,8,9	Café	4	Packaged AC	12.20		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 24,25	Guidance rooms	2	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library	Library	1	Packaged AC	20.00		Yes	1	Packaged AC	20.00		12.00		Yes	5.91	13,409	0.0	$1,557.36	$34,647.98	$1,830.00	21.07
RTU	Room 409, Room 413	2	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
RTU	Room 320	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU	Room 418	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		Yes	2.75	5,658	0.0	$657.11	$11,844.80	$710.00	16.95
RTU	Rooms 419,420,442	1	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU	Hallways 600	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 3,4,5,1	Room 507, 505,506	4	Packaged AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 5	Hallways 500	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ground	Highschool	1	Ductless Mini-Split AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU	Band Room	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU	High School	1	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU	High School	1	Ductless Mini-Split AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 422,402,403,404,406,407, 411,430,414A,414,421	CR 422,402,403,404,406,407, 411,430,414A,414,421	11	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 416, 417	High school	2	Split-System Air-Source HP	6.00	77.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
High School	Boiler Room	4	Condensing Hot Water Boiler	1,720.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
High School	Original Building	4	Condensing Hot Water Boiler	3,800.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Domestic hot water	2	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
(7) Women's restroom, (7) Men's Restroom, Nurse's office, (4) Staff restroom	48	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	103.9	$1,101.98	$344.16	$0.00	0.31
Main office printer room, Nurse's office, CR 318,Ceramic arts, 505,506	15	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	6.5	$68.87	$107.55	$0.00	1.56

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Low Temp Freezer (-35F to -5F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	4	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	3	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Ice Making Head (<450 lbs/day), Continuous	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	4	Gas Convection Oven (Half Size)	No	Yes	0.00	0	419.1	$4,444.39	$28,475.26	$2,000.00	5.96
Kitchen	2	Gas Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	No	Yes	0.00	0	184.5	$1,957.01	$16,598.81	$750.00	8.10
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Electric	N/A	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Montville high school	249	Computer	75.0	Yes
Montville high school	76	Laptop	40.0	Yes
Montville high school	9	Printer - Small	20.0	Yes
Montville high school	50	Printer - Medium	40.0	Yes
Montville high school	12	Printer - Big	100.0	Yes
Montville high school	6	Paper shredder	360.0	No
Montville high school	59	Projector	200.0	Yes
Montville high school	19	Microwave	900.0	No
Montville high school	1	Refrigerator - Small	20.0	No
Montville high school	2	Refrigerator - Medium	200.0	No
Montville high school	14	Refrigerator - Large	600.0	No
Montville high school	5	Coffee machine	400.0	Yes
Montville high school	2	Toaster	850.0	No
Montville high school	5	Toaster oven	1,200.0	No
Montville high school	2	Clothes washer	900.0	No
Montville high school	2	Clothes dryer	1,600.0	No
Montville high school	2	Dishwasher	1,500.0	No
Montville high school	21	Television - CRT	120.0	No
Montville high school	23	Television - LED	80.0	Yes
Montville high school	10	Space heater	1,500.0	No
Montville high school	6	Water dispenser	12.5	Yes
Montville high school	7	Standing fan	60.0	No
Montville high school	52	Smart board	5.0	Yes
Montville high school	32	Power shuttel chrome book cart	40.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	9	Refrigerated	Yes	0.00	14,507	0.0	$1,684.85	$2,070.00	$0.00	1.23

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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59

ENERGY STAR® Score[1]

Montville Township High School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 212,613
Built: 1970

For Year Ending: January 31, 2016
Date Generated: August 18, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Montville Township High School 100 Horseneck Road Montville, New Jersey 07045	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5943681

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
89.8 kBtu/ft²

Source EUI
176.3 kBtu/ft²

Annual Energy by Fuel	
Electric - Solar (kBtu)	334,722 (2%)
Electric - Grid (kBtu)	8,359,944 (44%)
Natural Gas (kBtu)	10,389,828 (54%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	97.2
National Median Source EUI (kBtu/ft²)	190.9
% Diff from National Median Source EUI	-8%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,479

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

Local Government Energy Audit:
Energy Audit Report

Cedar Hill Elementary School

46 Pine Brook Road

Towaco, NJ 07082

Montville Township BOE

September 7, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Cedar Hill Elementary School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Cedar Hill Elementary School is a 46,262 square foot facility comprised of various space types such as classrooms, restrooms, mechanical spaces, gymnasium, cafeteria and kitchen. The building has a main level and a sub-basement which has the mechanical room and a few classrooms. The school serves students in grades from kindergarten through five and the school hours on a typical weekday are from 8AM - 6PM. The school remains closed in the weekends.

Heating in the building is supplied by condensing hot water boilers and space cooling is provided by a combination of packaged units, window AC and split systems. Lighting at Cedar Hill Elementary School consists of inefficient T8 linear tubes and some smaller spaces lit using compact fluorescents and incandescent bulbs. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 8 measures which together represent an opportunity for Cedar Hill Elementary School to reduce annual energy costs by roughly $13,242 and annual greenhouse gas emissions by 104,036 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 9.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Cedar Hill Elementary School's annual energy use by 12%.

Figure 1 – Previous 12 Month Utility Costs

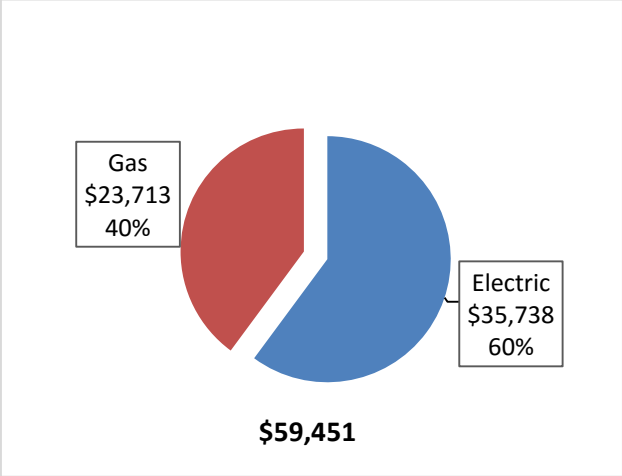
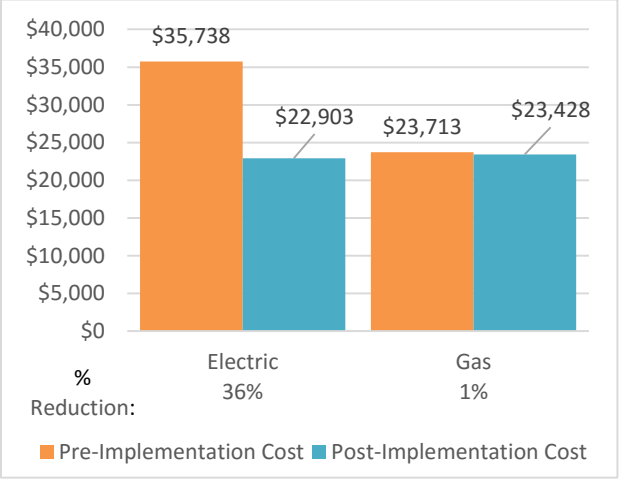


Figure 2 – Potential Post-Implementation Costs



A detailed description of Cedar Hill Elementary School's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**56,409**	**15.3**	**0.0**	**$7,285.87**	**$40,137.79**	**$7,490.00**	**$32,647.79**	**4.5**	**56,803**
ECM 1	Install LED Fixtures	Yes	12,300	1.6	0.0	$1,588.74	$5,078.80	$1,300.00	$3,778.80	2.4	12,386
ECM 2	Retrofit Fixtures with LED Lamps	Yes	44,108	13.7	0.0	$5,697.13	$35,058.99	$6,190.00	$28,868.99	5.1	44,417
Lighting Control Measures			**11,874**	**2.8**	**0.0**	**$1,533.65**	**$7,328.00**	**$1,330.00**	**$5,998.00**	**3.9**	**11,957**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	6,723	2.1	0.0	$868.42	$6,828.00	$900.00	$5,928.00	6.8	6,770
ECM 4	Install Daylight Dimming Controls	Yes	5,150	0.7	0.0	$665.23	$500.00	$430.00	$70.00	0.1	5,186
Variable Frequency Drive (VFD) Measures			**19,014**	**2.4**	**0.0**	**$2,455.88**	**$17,831.92**	**$0.00**	**$17,831.92**	**7.3**	**19,147**
ECM 5	Install VFDs on Hot Water Pumps	Yes	19,014	2.4	0.0	$2,455.88	$17,831.92	$0.00	$17,831.92	7.3	19,147
Electric Unitary HVAC Measures			**11,398**	**10.1**	**0.0**	**$1,472.19**	**$68,483.84**	**$3,761.00**	**$64,722.84**	**44.0**	**11,478**
	Install High Efficiency Electric AC	No	11,398	10.1	0.0	$1,472.19	$68,483.84	$3,761.00	$64,722.84	44.0	11,478
Domestic Water Heating Upgrade			**0**	**0.0**	**25.9**	**$285.81**	**$114.72**	**$0.00**	**$114.72**	**0.4**	**3,028**
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	25.9	$285.81	$114.72	$0.00	$114.72	0.4	3,028
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$208.19**	**$230.00**	**$0.00**	**$230.00**	**1.1**	**1,623**
ECM 7	Vending Machine Control	Yes	1,612	0.0	0.0	$208.19	$230.00	$0.00	$230.00	1.1	1,623
TOTAL OF EVALUATED MEASURES			**100,306**	**30.5**	**25.9**	**$13,241.59**	**$134,126.27**	**$12,581.00**	**$121,545.27**	**9.2**	**104,036**
TOTAL OF ALL RECOMMENDED MEASURES			**88,908.4**	**20.4**	**25.9**	**11,769.40**	**65,642.43**	**8,820.00**	**56,822.43**	**4.83**	**92,558.46**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC Energy Services also identified 8 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Cedar Hill Elementary School include:

- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Cedar Hill Elementary School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. For details on our evaluation and on-site generation potential, please refer to section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	973-331-7100 x 2228
Rich Medwin	Maintenance Supervisor	richard.medwin@montville.net	973-331-7100 x 2250
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 13, 2017, TRC Energy Services performed an energy audit at Cedar Hill Elementary School located in Towaco, NJ. TRC Energy Services' team met with Joseph Paladino to review the facility operations and help focus our investigation on specific energy-using systems.

Cedar Hill Elementary School is a 46,262 square foot facility comprised of various space types such as classrooms, restrooms, mechanical spaces, gymnasium, cafeteria and kitchen. The building has a main level and a sub-basement which has the mechanical room and a couple of classrooms. The school serves students in grades from kindergarten through five and the school hours on a typical weekday is from 8AM - 6PM.

Heating in the building is supplied by condensing hot water boilers and space cooling is provided by a combination of packaged units, window AC units and split systems. Lighting at Cedar Hill Elementary School consists of inefficient T8 linear tubes and some smaller spaces lit using compact fluorescents and incandescent bulbs. These have been recommended for replacements.

2.3 Building Occupancy

The typical schedule is presented in the table below. This is a 10 month school. The classes on a regular weekday start from 8AM – 3PM and the school is open for after school activities till 6PM. During a typical day, the facility is occupied by approximately 70 full time staff (including teachers, admin and maintenance and 350 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Cedar Hill Elementary School	Weekday	8AM - 6PM
Cedar Hill Elementary School	Weekend	No Operation

2.4 Building Envelope

The building was constructed in 1964 using concrete block and structural steel with a brick (and window) facade. The roof is covered with EPDM membrane on the newer addition of the building and asphalt on the original section of the building. Due to inclement weather during the time of the audit, there was no roof access for the auditor onsite. We have used other resources to acquire data for the same. The

windows in the building are all double pane and installed 12 years ago. The doors are aluminum/aluminum framed glass that were observed to be in decent condition. There were no signs of excessive infiltration.

Image 1 Various parts of the building envelope

2.5 On-Site Generation

Cedar Hill Elementary School does not have any on-site electric generation system currently installed.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps with electronic ballasts as well as some incandescent and compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 4-lamp, 4-foot long troffers. A small area of the building such as a few offices and the restrooms in the kindergarten classrooms, storage closets etc are primarily lit with 13-watt, 32-watt or 42-watt CFL lamps. The closets in the gym have 100-watt incandescent lamps lighting the areas. Few spaces in the school have been retrofitted with LED lamps/tubes.

Lighting control in most spaces is provided by manual wall switches. However, spaces like the mechanical room, storage closets, a few restrooms, staff restroom and nurse's office, the lighting control is provided using occupancy sensors. The occupancy sensors are either wall or ceiling mounted depending on the space layout. It was mentioned by the site contact that all Exit signs in the school are 2-watt LED fixtures. The building's exterior lighting consists primarily of metal halide fixtures that are controlled by timers.

Image 2 Types lighting fixtures found at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Hot Water (or Steam) Heating System

The hot water system consists of two condensing hot water boilers from AERCO with an output capacity of 1720 MBh. The boilers have a combustion efficiency of 86%. The hot water is supplied to various parts of the school using (2) 5hp, (2) 3hp and (2) 1.5hp constant speed pumps. Hot water is supplied at 180°F when the outside air temperature is below 50°F. The boilers stay on all the time and modulated to different lower temperatures based on the OAT until the outside air is above 65°F. Above this temperature, the boilers are shut off.

The heating demand in the building has pneumatic controls. When the temperature in the rooms is less than the setpoint, the valves in the terminal units opens to let the hot water from the boilers into the hot water coil. The fans in the units blow the heated air to the respective spaces until the room temperature reaches the setpoint. The terminal units such as unit ventilators and baseboard radiators distribute the heated air to the respective spaces.

The boilers are 12 years old and the pumps are 15 years old (on an average), in good condition and well maintained.

Image 3 Images showing the boilers, pumps, terminal units and heating controls at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Direct Expansion Air Conditioning System (DX)

The space cooling in the Cedar Hill Elementary School is provided by multiple split AC systems, window AC units in the main office and a few packaged AC units.

Most of the classrooms are cooled either using 2.5 ton or 3 ton split AC units from Fujitsu and Comfort Aire respectively. These are newer units and less than 4 years old. Some other classrooms are served using 2 or 3 ton packaged units from Carrier which are 20 years old. The cafeteria has the largest cooling unit (15 tons) from Trane and is 18 years old. As the school has equipment of with varied ages, a lot of the older units have been evaluated for replacements but the pay back on replacing these units are high. The cooling controls comprises of programmable (for newer split units) and non-programmable thermostats (older packaged units) in the respective zones.

Image 4 AC units and controls seen at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of two domestic water heater (one electric and one gas fired) at the facility. The natural gas fired water heater (from Bradford White) has an input capacity of 65 MBh, tank capacity of 48 gallons and an efficiency of 79%. The electric water heater (from State Industries Inc.) has an input capacity of 5.5 kW and a tank capacity of 30 gallons. Both of these waters heaters were newly installed and under 2 year old. These are in good condition and well maintained.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

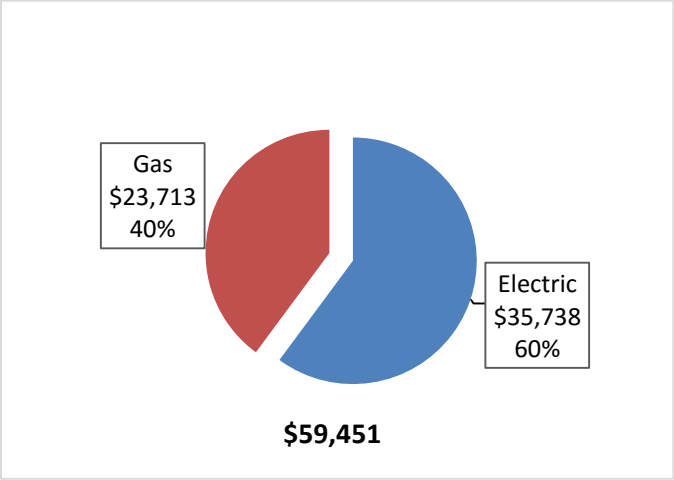
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Cedar Hill Elementary School		
Fuel	**Usage**	**Cost**
Electricity	276,690 kWh	$35,738
Natural Gas	21,460 Therms	$23,713
Total		**$59,451**

The current annual energy cost for this facility is $59,451 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.129/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Sol. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

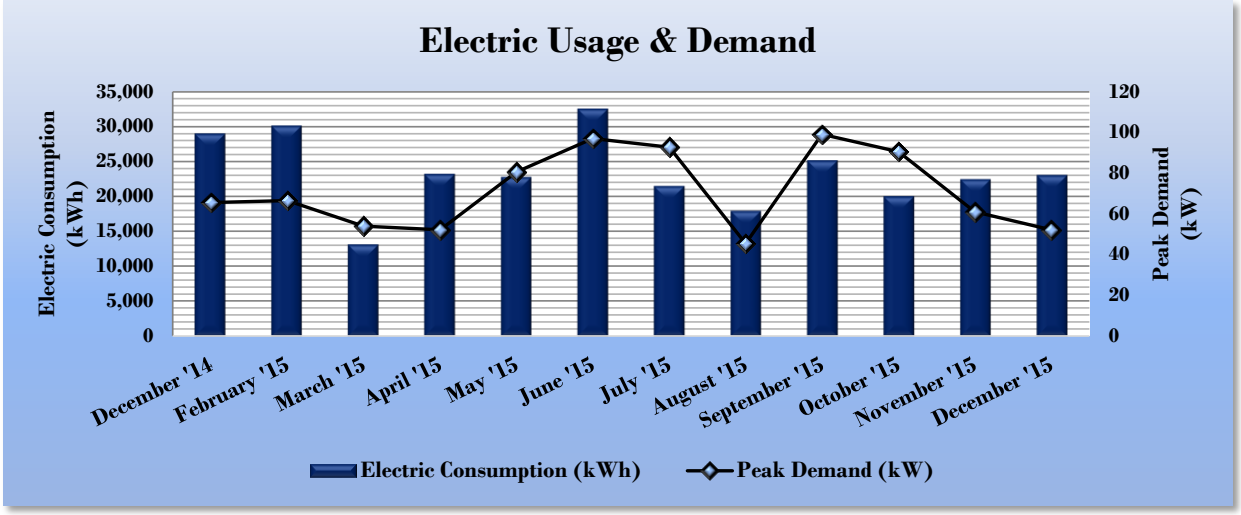


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Cedar Hill Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/15/15	30	28,960	66	$424	$3,603
2/17/15	33	30,080	67	$430	$3,729
3/20/15	31	13,120	54	$349	$1,606
4/20/15	31	23,200	52	$314	$2,973
5/18/15	28	22,720	81	$452	$3,067
6/18/15	31	32,480	97	$583	$4,168
7/20/15	32	21,440	93	$557	$3,053
8/19/15	30	17,920	45	$273	$2,425
9/18/15	30	25,120	99	$508	$2,861
10/19/15	31	20,000	91	$508	$2,861
11/18/15	30	22,400	61	$342	$2,934
12/21/15	33	23,040	52	$293	$2,947
Totals	**370**	**280,480**	**99.1**	**$5,033**	**$36,227**
Annual	**365**	**276,690**	**99.1**	**$4,965**	**$35,738**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.105/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

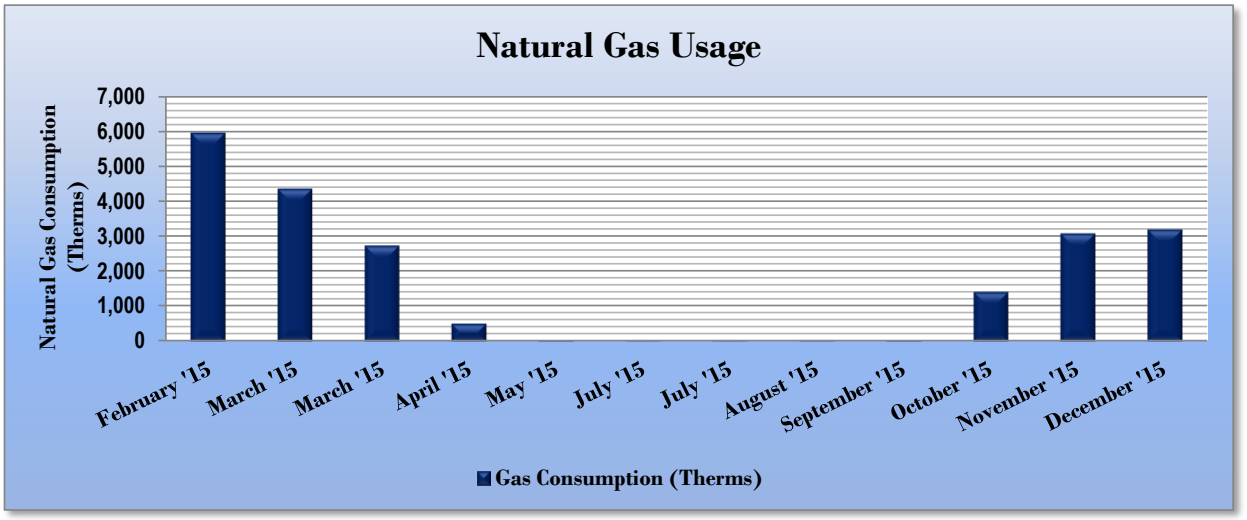


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Cedar Hill Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/18/15	30	5,945	$5,579
3/19/15	29	4,348	$4,267
4/15/15	27	2,726	$2,747
5/13/15	28	503	$907
6/15/15	33	13	$500
7/17/15	32	4	$493
8/14/15	28	1	$491
9/14/15	31	4	$493
10/8/15	24	11	$400
11/10/15	33	1,406	$1,596
12/14/15	34	3,075	$2,945
1/15/16	32	3,188	$3,035
Totals	**361**	**21,224**	**$23,453**
Annual	**365**	**21,460**	**$23,713**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Cedar Hill Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	112.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	66.8	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Cedar Hill Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	89.2	141.4
Site Energy Use Intensity (kBtu/ft^2)	58.9	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 81.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

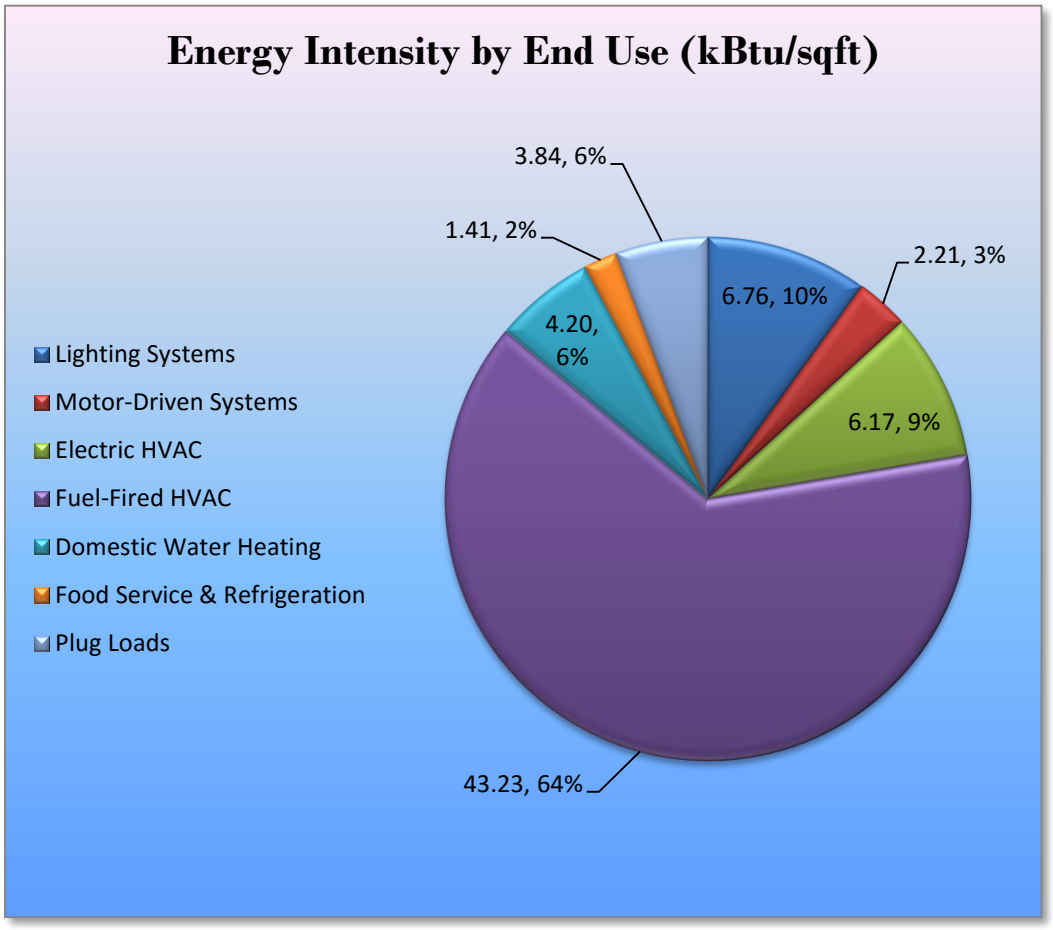
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (kBtu/SF, %)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Cedar Hill Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**56,409**	**15.3**	**0.0**	**$7,285.87**	**$40,137.79**	**$7,490.00**	**$32,647.79**	**4.5**	**56,803**
ECM 1	Install LED Fixtures	Yes	12,300	1.6	0.0	$1,588.74	$5,078.80	$1,300.00	$3,778.80	2.4	12,386
ECM 2	Retrofit Fixtures with LED Lamps	Yes	44,108	13.7	0.0	$5,697.13	$35,058.99	$6,190.00	$28,868.99	5.1	44,417
Lighting Control Measures			**11,874**	**2.8**	**0.0**	**$1,533.65**	**$7,328.00**	**$1,330.00**	**$5,998.00**	**3.9**	**11,957**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	6,723	2.1	0.0	$868.42	$6,828.00	$900.00	$5,928.00	6.8	6,770
ECM 4	Install Daylight Dimming Controls	Yes	5,150	0.7	0.0	$665.23	$500.00	$430.00	$70.00	0.1	5,186
Variable Frequency Drive (VFD) Measures			**19,014**	**2.4**	**0.0**	**$2,455.88**	**$17,831.92**	**$0.00**	**$17,831.92**	**7.3**	**19,147**
ECM 5	Install VFDs on Hot Water Pumps	Yes	19,014	2.4	0.0	$2,455.88	$17,831.92	$0.00	$17,831.92	7.3	19,147
Electric Unitary HVAC Measures			**11,398**	**10.1**	**0.0**	**$1,472.19**	**$68,483.84**	**$3,761.00**	**$64,722.84**	**44.0**	**11,478**
	Install High Efficiency Electric AC	No	11,398	10.1	0.0	$1,472.19	$68,483.84	$3,761.00	$64,722.84	44.0	11,478
Domestic Water Heating Upgrade			**0**	**0.0**	**25.9**	**$285.81**	**$114.72**	**$0.00**	**$114.72**	**0.4**	**3,028**
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	25.9	$285.81	$114.72	$0.00	$114.72	0.4	3,028
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$208.19**	**$230.00**	**$0.00**	**$230.00**	**1.1**	**1,623**
ECM 7	Vending Machine Control	Yes	1,612	0.0	0.0	$208.19	$230.00	$0.00	$230.00	1.1	1,623
TOTAL OF ALL RECOMMENDED MEASURES			**88,908.4**	**20.4**	**25.9**	**11,769.40**	**65,642.43**	**8,820.00**	**56,822.43**	**4.83**	**92,558.46**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**56,409**	**15.3**	**0.0**	**$7,285.87**	**$40,137.79**	**$7,490.00**	**$32,647.79**	**4.5**	**56,803**
ECM 1	Install LED Fixtures	12,300	1.6	0.0	$1,588.74	$5,078.80	$1,300.00	$3,778.80	2.4	12,386
ECM 2	Retrofit Fixtures with LED Lamps	44,108	13.7	0.0	$5,697.13	$35,058.99	$6,190.00	$28,868.99	5.1	44,417

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	12,300	1.6	0.0	$1,588.74	$5,078.80	$1,300.00	$3,778.80	2.4	12,386

Measure Description

We recommend replacing existing exterior fixtures containing HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	41,942	13.4	0.0	$5,417.38	$34,883.99	$6,190.00	$28,693.99	5.3	42,236
Exterior	2,166	0.3	0.0	$279.75	$175.00	$0.00	$175.00	0.6	2,181

Measure Description

We recommend retrofitting existing incandescent, CFL and linear T8 tubes with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**11,874**	**2.8**	**0.0**	**$1,533.65**	**$7,328.00**	**$1,330.00**	**$5,998.00**	**3.9**	**11,957**
ECM 3	Install Occupancy Sensor Lighting Controls	6,723	2.1	0.0	$868.42	$6,828.00	$900.00	$5,928.00	6.8	6,770
ECM 4	Install Daylight Dimming Controls	5,150	0.7	0.0	$665.23	$500.00	$430.00	$70.00	0.1	5,186

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
6,723	2.1	0.0	$868.42	$6,828.00	$900.00	$5,928.00	6.8	6,770

Measure Description

We recommend installing occupancy sensors to control lighting fixtures (in spaces such as classrooms and offices) that are currently controlled by manual switches. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant

offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 4: Install Daylight Dimming Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,150	0.7	0.0	$665.23	$500.00	$430.00	$70.00	0.1	5,186

Measure Description

We recommend installing daylight dimming controls that use photosensors to reduce electric lighting in areas when ample daylight lighting is present. Photosensor controls are recommended for fixtures that are adjacent to windows that receive lots of sunlight. As sunlight level increase in the room, fixture lighting is decreased or turned off. This measure reduces energy use in spaces where sufficient lighting levels can be met by ambient daylight.

Optimum light levels and the method of dimming should be determined during lighting design. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**19,014**	**2.4**	**0.0**	**$2,455.88**	**$17,831.92**	**$0.00**	**$17,831.92**	**7.3**	**19,147**
ECM 5	Install VFDs on Hot Water Pumps	19,014	2.4	0.0	$2,455.88	$17,831.92	$0.00	$17,831.92	7.3	19,147

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about current motors systems and VFD recommendations.

ECM 5: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
19,014	2.4	0.0	$2,455.88	$17,831.92	$0.00	$17,831.92	7.3	19,147

Measure Description

We recommend installing a variable frequency drives (VFD) to control the 5 hp, 3 hp and 1.5 hp hot water pumps that circulate heating hot water. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load. Please note that it is important to know if the installation of the VFDs are suited for the boilers (from the manufacturers) as the low water flow might not be good for the boilers.

4.1.4 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 19 below.

Figure 19 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**25.9**	**$285.81**	**$114.72**	**$0.00**	**$114.72**	**0.4**	**3,028**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	25.9	$285.81	$114.72	$0.00	$114.72	0.4	3,028

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 6: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	25.9	$285.81	$114.72	$0.00	$114.72	0.4	3,028

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.5 Plug Load Equipment Control - Vending Machines

ECM 7: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$208.19	$230.00	$0.00	$230.00	1.1	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

4.2 ECMs Evaluated but not Recommended

4.2.1 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 20 below.

Figure 20 - Summary of Unitary HVAC ECMs

Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**11,398**	**10.1**	**0.0**	**$1,472.19**	**$68,483.84**	**$3,761.00**	**$64,722.84**	**44.0**	**11,478**
Install High Efficiency Electric AC	No	11,398	10.1	0.0	$1,472.19	$68,483.84	$3,761.00	$64,722.84	44.0	11,478

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about existing HVAC equipment and proposed upgrades.

ECM 8: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
11,398	10.1	0.0	$1,472.19	$68,483.84	$3,761.00	$64,722.84	44.0	11,478

Measure Description

We evaluated replacing the (2) window AC units, (7) split AC units and (3) packaged AC units serving classrooms. Cafeteria and a few offices. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not recommending

Although some of these units are inefficient and older than 18 years, the pay back that was evaluated on replacing them is very high as an individual measure. However, when implemented with all other suggested measures, the overall pay back is under 5 year. When these equipment reach the end of their useful life, we recommend that they be replaced with high efficiency units.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.4 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

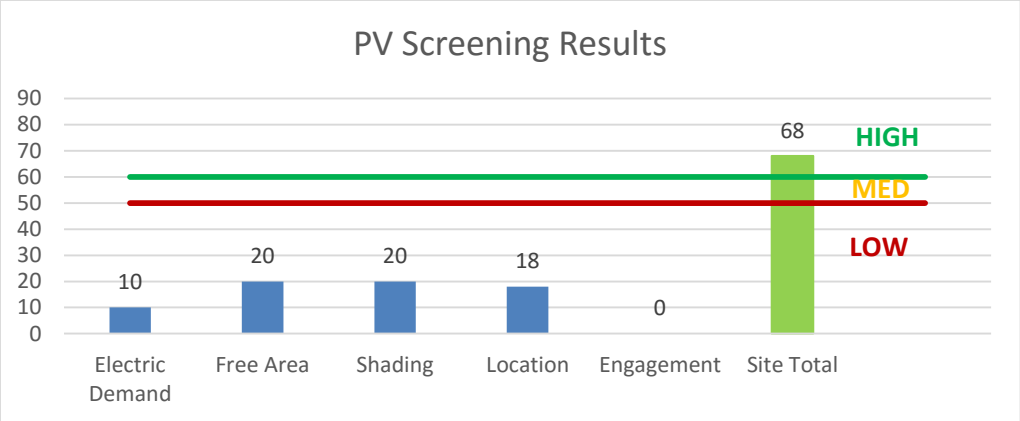
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the building may be feasible. If Cedar Hill Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 21 - Photovoltaic Screening



Potential	High	
System Potential	71	kW DC STC
Electric Generation	84,587	kWh/yr
Displaced Cost	$7,360	/yr
Installed Cost	$184,600	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use

the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Install Occupancy Sensor Lighting Controls	x		x
ECM 4	Install Daylight Dimming Controls	x		x
ECM 5	Install VFDs on Hot Water Pumps		x	x
ECM 6	Install Low-Flow Domestic Hot Water Devices			x
ECM 7	Vending Machine Control			x

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific

eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a

manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.02	70	0.0	$9.02	$58.50	$10.00	5.38
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.06	209	0.0	$27.06	$175.50	$30.00	5.38
Room 2	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,288	0.44	1,412	0.0	$182.35	$1,206.00	$195.00	5.54
Room1	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,288	0.44	1,412	0.0	$182.35	$1,206.00	$195.00	5.54
Stairwell	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,840	None	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.22	698	0.0	$90.19	$585.00	$100.00	5.38
Gym	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,840	0.29	948	0.0	$122.44	$761.07	$160.00	4.91
Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,288	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,288	0.15	342	0.0	$44.19	$409.50	$70.00	7.68
Nurse's office	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,288	None	No	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,288	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Staff RR	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,840	None	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Girls' restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,288	0.19	621	0.0	$80.24	$650.53	$115.00	6.67
Boys' restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,288	0.19	621	0.0	$80.24	$650.53	$115.00	6.67
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.22	698	0.0	$90.19	$585.00	$100.00	5.38
Custodial closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	52	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.04	4	0.0	$0.51	$117.00	$20.00	190.28
Electrical closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	52	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	52	0.06	6	0.0	$0.76	$150.40	$30.00	157.45
CR 14. 16, 18,19,17,20,15,13,12,22,3, 5,7,9,11,10,8	204	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	Yes	204	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,288	5.58	18,000	0.0	$2,324.97	$16,524.00	$2,635.00	5.97
Hallway	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.39	1,257	0.0	$162.34	$1,053.00	$180.00	5.38
Room 4	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,288	0.19	621	0.0	$80.24	$496.53	$100.00	4.94
Library	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.52	1,676	0.0	$216.46	$1,404.00	$240.00	5.38
Copy room	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,840	0.11	355	0.0	$45.92	$285.40	$60.00	4.91
Girls' restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,840	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,840	0.03	105	0.0	$13.53	$75.20	$15.00	4.45
Girls' restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.02	70	0.0	$9.02	$58.50	$10.00	5.38
Boys' restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,840	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,840	0.03	105	0.0	$13.53	$75.20	$15.00	4.45
Boys' restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.02	70	0.0	$9.02	$58.50	$10.00	5.38
Boiler Room	6	Compact Fluorescent: 1 lamp	Wall Switch	13	1,840	Relamp	No	6	LED Screw-In Lamps: 1 lamp	Wall Switch	8	1,840	0.02	63	0.0	$8.20	$210.00	$0.00	25.61

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 1,2 lavatory	2	Compact Fluorescent: 3 lamps	Wall Switch	39	1,840	Relamp	No	2	LED Screw-In Lamps: 3 lamps	Wall Switch	24	1,840	0.02	63	0.0	$8.20	$210.00	$0.00	25.61
Closet gym	1	Compact Fluorescent: 1 lamp	Wall Switch	42	1,840	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	11	1,840	0.02	66	0.0	$8.47	$35.00	$0.00	4.13
Closet gym	3	Incandescent: 1 lamp	Wall Switch	100	1,840	Relamp	No	3	LED Screw-In Lamps: 1 lamp	Wall Switch	14	1,840	0.17	546	0.0	$70.51	$105.00	$15.00	1.28
Closet	1	Incandescent: 1 lamp	Occupancy Sensor	100	52	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	14	52	0.06	5	0.0	$0.66	$35.00	$5.00	45.16
Nurse office lav	1	Compact Fluorescent: 3 lamps	Wall Switch	78	1,840	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Wall Switch	24	1,840	0.04	114	0.0	$14.76	$105.00	$0.00	7.11
Staff RR	3	LED Screw-In Lamps: 1 lamp	Wall Switch	14	1,840	Relamp	Yes	3	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	7	1,288	0.02	55	0.0	$7.05	$375.00	$50.00	46.09
CR 3 lav	1	Compact Fluorescent: 1 lamp	Wall Switch	26	1,840	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	7	1,840	0.01	40	0.0	$5.19	$35.00	$0.00	6.74
Hallway	2	Compact Fluorescent: 2 lamps	Wall Switch	64	1,840	Relamp	No	2	LED Screw-In Lamps: 2 lamps	Wall Switch	16	1,840	0.06	203	0.0	$26.24	$140.00	$0.00	5.34
Staff RR	3	Incandescent: BR 40 - 1 lamp	Occupancy Sensor	120	1,288	Relamp	No	3	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	14	1,288	0.21	471	0.0	$60.84	$234.76	$15.00	3.61
Boiler room, Hallway, Gym, Cafeteria	18	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	18	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Art room	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,288	0.36	1,147	0.0	$148.16	$876.50	$150.00	4.90
Adjacent to speech room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,288	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,288	0.15	332	0.0	$42.85	$380.53	$80.00	7.01
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.19	628	0.0	$81.17	$526.50	$90.00	5.38
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,840	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,840	0.03	105	0.0	$13.53	$75.20	$15.00	4.45
Room 131 - Nurse	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,840	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,840	0.39	1,257	0.0	$162.34	$902.40	$180.00	4.45
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	52	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.04	4	0.0	$0.51	$117.00	$20.00	190.28
Electrical room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,840	0.04	118	0.0	$15.31	$95.13	$20.00	4.91
Hallway	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	23	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.50	1,606	0.0	$207.44	$1,345.50	$230.00	5.38
Room 138	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,288	0.33	1,059	0.0	$136.76	$972.00	$155.00	5.97
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	52	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	52	0.02	2	0.0	$0.25	$58.50	$10.00	190.28
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	52	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	52	0.01	1	0.0	$0.12	$48.20	$10.00	309.11
Room 137,136,135,134	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,840	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,288	1.97	6,353	0.0	$820.58	$3,879.60	$755.00	3.81
Room 137,136,135,133 lavatory	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,288	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,288	0.04	95	0.0	$12.24	$192.80	$40.00	12.48
Room 133 - lounge	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,840	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,288	0.21	662	0.0	$85.48	$492.00	$95.00	4.64
Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.13	419	0.0	$54.11	$351.00	$60.00	5.38

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,840	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,840	0.09	279	0.0	$36.08	$234.00	$40.00	5.38
Cafeteria	30	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,840	Relamp	No	30	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,840	1.10	3,555	0.0	$459.16	$2,854.00	$600.00	4.91
Cafeteria	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,840	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,840	0.02	68	0.0	$8.75	$96.40	$20.00	8.74
Boys' restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,288	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,288	0.01	24	0.0	$3.06	$48.20	$10.00	12.48
Girls' restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,288	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,288	0.01	24	0.0	$3.06	$48.20	$10.00	12.48
Custodian closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	52	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	52	0.01	1	0.0	$0.12	$48.20	$10.00	309.11
Exterior lights	9	Metal Halide: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	Yes	9	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	141	2,190	1.32	10,177	0.0	$1,314.52	$3,766.09	$1,305.00	1.87
Exterior lights	5	Compact Fluorescent: 1 lamp	Wall Switch	100	4,380	Relamp	No	5	LED Screw-In Lamps: 1 lamp	Wall Switch	14	4,380	0.28	2,166	0.0	$279.75	$175.00	$0.00	0.63
Exterior lights	4	Metal Halide: (1) 400W Lamp	Wall Switch	458	4,380	Fixture Replacement	Yes	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	194	2,190	0.95	7,273	0.0	$939.45	$1,812.71	$580.00	1.31

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Boiler	2	Heating Hot Water Pump	1.5	86.5%	No	2,745	No	86.5%	Yes	2	0.39	3,089	0.0	$399.03	$5,264.92	$0.00	13.19
Boiler room	Boiler	2	Heating Hot Water Pump	3.0	89.5%	No	2,745	No	89.5%	Yes	2	0.75	5,972	0.0	$771.32	$6,015.30	$0.00	7.80
Boiler room	Boiler	2	Heating Hot Water Pump	5.0	89.5%	No	2,745	No	89.5%	Yes	2	1.26	9,953	0.0	$1,285.53	$6,551.70	$0.00	5.10
Boiler room	Air compressor	2	Air Compressor	1.0	77.0%	No	4,957	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 14,16,18,20,19	Room 14,16,18,20,19,9,11,10,8	9	Split-System Air-Source HP	3.00	32.70	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 17,15,13,22	Room 17,15,13,22,3,5,7	7	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tech room	Tech room	2	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cedar Hill	Classrooms	1	Packaged AC	2.00		Yes	1	Packaged AC	2.00		14.00		No	0.40	386	0.0	$49.82	$4,537.92	$184.00	87.39
Cedar Hill	Classrooms	1	Packaged AC	3.00		Yes	1	Packaged AC	3.00		14.00		No	0.60	579	0.0	$74.73	$6,806.88	$276.00	87.39
Cedar Hill	Cafeteria	1	Packaged AC	15.00		Yes	1	Packaged AC	15.00		13.00		No	2.32	2,250	0.0	$290.61	$20,907.75	$1,185.00	67.87
Cedar Hill	Classrooms	6	Split-System AC	3.50		Yes	6	Split-System AC	3.50		16.00		No	5.68	6,615	0.0	$854.41	$31,420.62	$1,932.00	34.51
Cedar Hill	Classrooms	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		16.00		No	0.54	630	0.0	$81.37	$2,992.44	$184.00	34.51
Principal's office	Pricipal's office	1	Window AC	0.67		Yes	1	Window AC	0.67		12.00		No	0.30	499	0.0	$64.44	$729.47	$0.00	11.32
Main Office	Main Office	1	Window AC	1.00		Yes	1	Window AC	1.00		12.00		No	0.26	440	0.0	$56.81	$1,088.76	$0.00	19.17

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	All school	2	Condensing Hot Water Boiler	1,720.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Kitchen and restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	New wing restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Girls' restroom, Boys' restroom,	14	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	22.6	$250.08	$100.38	$0.00	0.40
Staff restroom	2	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	3.2	$35.73	$14.34	$0.00	0.40

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage	1	Freezer Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	1	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lounge	1	Electric Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Cedar Hill Elementary School	95	Computer	150.0	Yes
Cedar Hill Elementary School	9	Laptop	45.0	Yes
Cedar Hill Elementary School	12	Printer Small	20.0	Yes
Cedar Hill Elementary School	4	Printer medium	60.0	Yes
Cedar Hill Elementary School	3	Printer Large	600.0	Yes
Cedar Hill Elementary School	1	paper shredder	150.0	No
Cedar Hill Elementary School	22	Projector	200.0	Yes
Cedar Hill Elementary School	4	Microwave	1,000.0	No
Cedar Hill Elementary School	3	Refrigerator - medium	156.0	No
Cedar Hill Elementary School	4	Refrigerator - large	172.0	No
Cedar Hill Elementary School	1	Refrigerator - double door	218.0	No
Cedar Hill Elementary School	2	Coffee machine	900.0	Yes
Cedar Hill Elementary School	2	Toaster oven	1,200.0	No
Cedar Hill Elementary School	7	CRT television	120.0	No
Cedar Hill Elementary School	1	Space heater	1,500.0	No
Cedar Hill Elementary School	20	Smart Board	5.0	Yes
Cedar Hill Elementary School	6	Chrome book	40.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lounge	1	Refrigerated	Yes	0.00	1,612	0.0	$208.19	$230.00	$0.00	1.10

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Cedar Hill Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 46,262
Built: 1964

For Year Ending: December 31, 2015
Date Generated: August 22, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Cedar Hill Elementary School 46 Pine Brook Road Towaco, New Jersey 07082	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5944396

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
66.7 kBtu/ft²

Source EUI
112 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	2,153,377 (70%)
Electric - Grid (kBtu)	930,289 (30%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	91
National Median Source EUI (kBtu/ft²)	152.9
% Diff from National Median Source EUI	-27%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	218

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

Local Government Energy Audit:
Energy Audit Report

Board of Education Office

86 River Road

Montville, NJ 07045

Montville Township BOE

October 13, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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Appendix A: Equipment Inventory & Recommendations

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Board of Education Office.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Board of Education Office is a 7,000 square foot office facility primarily comprising of office spaces. The facility operates from 8:30 AM to 4:30 PM on the weekdays for all 12 months..

The heating and cooling in the building is provided using two heat pumps. Below a certain temperature, the heat is provided by a gas fired furnace. Lighting at Board of Education Office consists of aging and inefficient linear T8 fixtures. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 3 measures which together represent an opportunity for Board of Education Office to reduce annual energy costs by roughly $1,868 and annual greenhouse gas emissions by 16,941 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 3.6 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Board of Education Office's annual energy use by 7%.

Figure 1 – Previous 12 Month Utility Costs

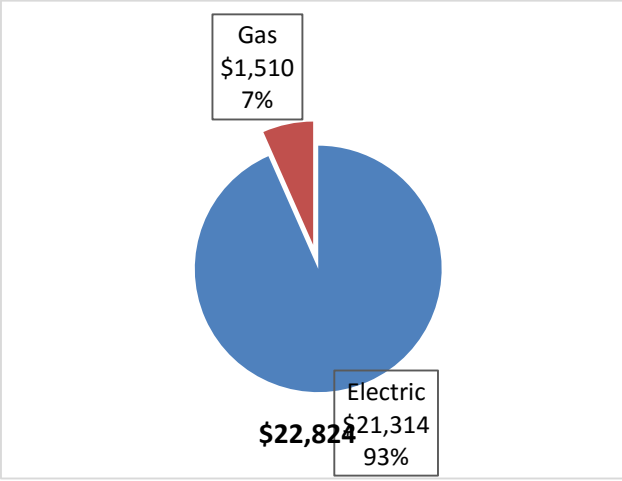
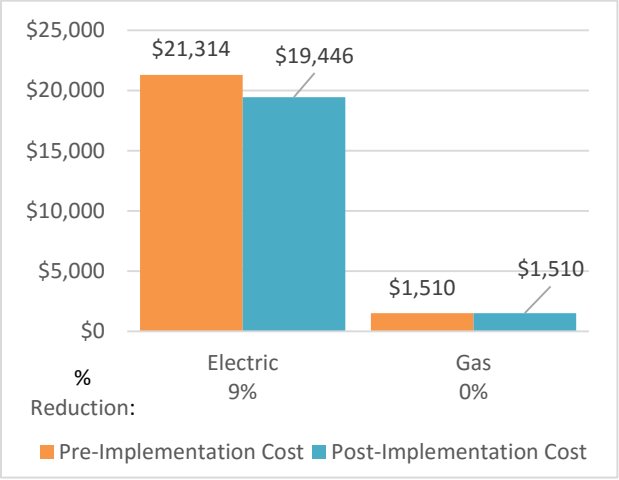


Figure 2 – Potential Post-Implementation Costs



A detailed description of Board of Education Office's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**13,302**	**3.1**	**0.0**	**$1,476.98**	**$6,320.80**	**$1,175.00**	**$5,145.80**	**3.5**	**13,395**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	13,302	3.1	0.0	$1,476.98	$6,320.80	$1,175.00	$5,145.80	3.5	13,395
Lighting Control Measures			**2,154**	**0.5**	**0.0**	**$239.21**	**$1,776.00**	**$260.00**	**$1,516.00**	**6.3**	**2,169**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	2,154	0.5	0.0	$239.21	$1,776.00	$260.00	$1,516.00	6.3	2,169
Domestic Water Heating Upgrade			**1,367**	**0.0**	**0.0**	**$151.80**	**$50.19**	**$0.00**	**$50.19**	**0.3**	**1,377**
ECM 3	Install Low-Flow Domestic Hot Water Devices	Yes	1,367	0.0	0.0	$151.80	$50.19	$0.00	$50.19	0.3	1,377
TOTALS			**16,823**	**3.7**	**0.0**	**$1,867.99**	**$8,146.99**	**$1,435.00**	**$6,711.99**	**3.6**	**16,941**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Energy Efficient Practices

TRC Energy Services also identified 5 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Board of Education Office include:

- Use Window Treatments/Coverings
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Perform Proper Water Heater Maintenance
- Water Conservation

For details on these Energy Efficient Practices, please refer to section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Board of Education Office. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and on-site generation potential, please refer to section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Direct Install (DI)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	(973) 331-7100
Steven Toth	Facilities Manager	steven.toth@montville.net	973-331-7100 Extn: 2236
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolution.com	(732) 855-0033

2.2 General Site Information

On February 08, 2017, TRC Energy Services performed an energy audit at Board of Education Office located in Montville, NJ. TRC Energy Services' team met with Ronald Augustine to review the facility operations and help focus our investigation on specific energy-using systems.

Board of Education Office is a 7,000 square foot office facility primarily comprising of office spaces. The facility operates from 8:30 AM to 4:30 PM on the weekdays for all 12 months.

The building was constructed in 2009. The heating and cooling in the building is provided using two heat pumps. Below a certain temperature, the heat is provided by a gas fired furnace. Lighting at Board of Education Office consists of aging and inefficient linear T8 fixtures.

2.3 Building Occupancy

The typical schedule is presented in the table below. The entire facility is used year round and is open from 8:30AM – 4:30PM during the weekdays and remains closed during winter. On a typical day the building is occupied by 26 full time staff.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Board of Education Office	Weekday	8:30AM - 4:30PM
Board of Education Office	Weekend	No operation

2.4 Building Envelope

The building is constructed using concrete block and steel framing with a concrete and window facade. The building has pitched tile roof with asphalt shingles on one part and flat roof (reflective membrane) on the other part. The auditor onsite did not have roof access due to inclement weather. Other resources were used to obtain this information. The windows are double pane and doors are made of glass framed aluminum. There were no signs of excessive air filtration.

Image 1 Building envelope pictures

2.5 On-Site Generation

Board of Education Office does not have any on-site electric generation systems currently installed.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps with electronic ballasts. Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers. A main entrance of the building is lit with 26-watt CFL lamps in recessed can ceiling fixtures. Lighting control in most spaces is provided by manual wall switches. The occupancy sensors are wall mounted. The building EXIT signs are 2-watt LED fixtures.

Image 2 Typical lighting fixture at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Heating and Air Conditioning System (DX)

The heating in the building is provided using heat pumps and supported using a gas fired furnace during extreme temperatures. There are two Daikin heat pumps in the buildings with a heating capacity of 135kBtu/hr each. The heat pumps provide heat to the building until the outside air temperature reaches 20 °F. Below this temperature the building is heated using a furnace from Sterling with a heating capacity of 135 MBh and a thermal efficiency of 80%. The heat is distributed using indoor ceiling heads and unit

vents in the respective zones as shown in image 3. The indoor ceiling heads are VRV (variable refrigerant volume) systems that has the ability to maintain temperatures at individual zones.

The space cooling is also provided using the two Daikin heat pumps with cooling capacities of 10 tons each and distributed using the heads in the respective zones. These units serve the office suites. There are two split AC units of 1 ton each serving the IT closet and conference room.

Both heating and cooling equipment are controlled using programmable thermostats. All these units are 8 years old, in good condition and well maintained.

Image 3 Heating and cooling unit, terminal unit and thermostat

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one electric water heater with an input capacity of 1.65 kW and a tank capacity of 6 gallons. The water heater serves the restrooms and kitchenette sinks. The equipment is 7 years old and in good condition.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Building Plug Load

There are roughly 41 computer work stations throughout the facility. Few of the employees also have laptops. Other plug loads in the facility includes printers, projectors, space heaters, standing fans and kitchenette equipment such as microwaves, refrigerators, coffee machines, toasters and toaster ovens. . There is no centralized PC power management software installed.

There is one IT closet that is being cooled using a dedicated split AC system.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

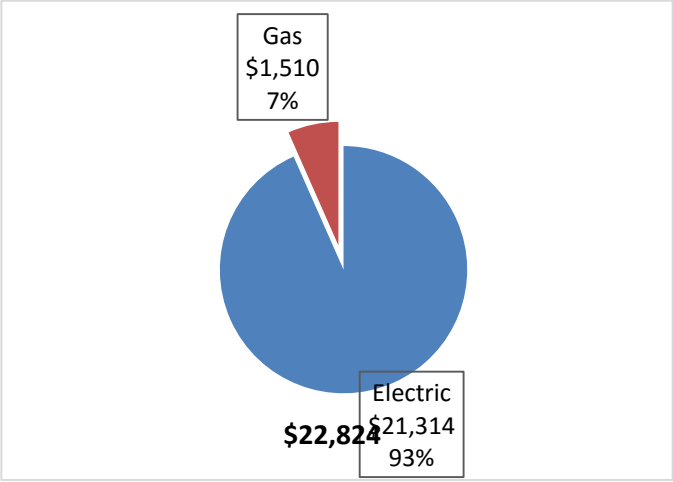
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Board of Education Office		
Fuel	**Usage**	**Cost**
Electricity	191,954 kWh	$21,314
Natural Gas	1,456 Therms	$1,510
Total		**$22,824**

The current annual energy cost for this facility is $22,824 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.111/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

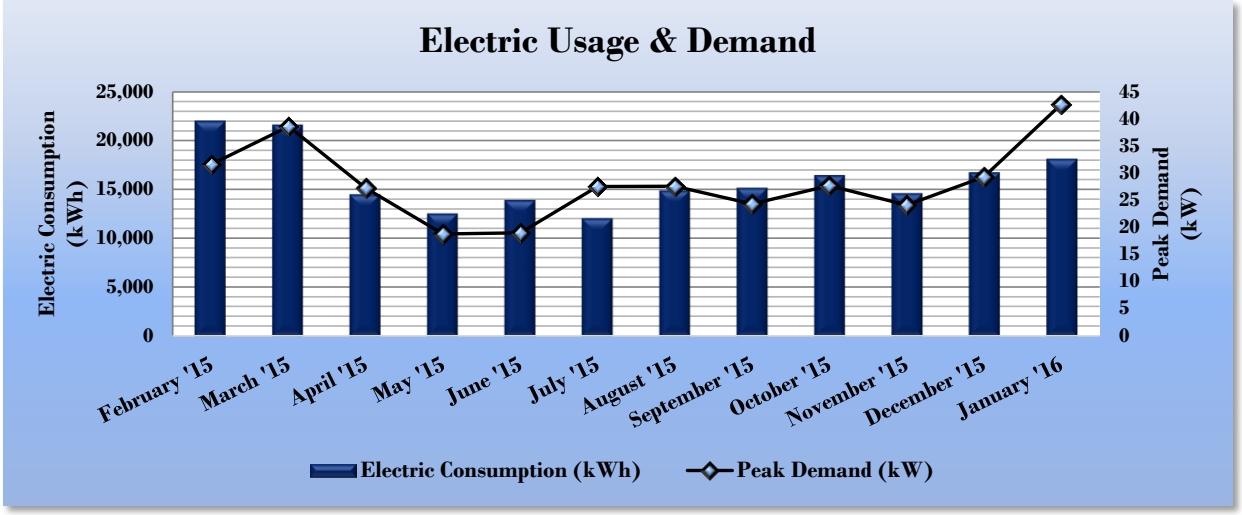


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Board of Education Office					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/16/15	30	22,000	32	$204	$2,376
3/16/15	28	21,600	39	$250	$2,299
4/16/15	31	14,480	27	$164	$1,632
5/17/15	31	12,520	19	$105	$1,388
6/17/15	31	13,920	19	$114	$1,536
7/18/15	31	12,040	28	$165	$1,402
8/17/15	30	14,880	28	$166	$1,680
9/16/15	30	15,160	24	$146	$1,688
10/19/15	33	16,440	28	$155	$1,820
11/16/15	28	14,600	24	$135	$1,622
12/16/15	30	16,720	29	$164	$1,859
1/18/16	33	18,120	43	$240	$2,071
Totals	**366**	**192,480**	**42.7**	**$2,010**	**$21,373**
Annual	**365**	**191,954**	**42.7**	**$2,004**	**$21,314**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.036/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

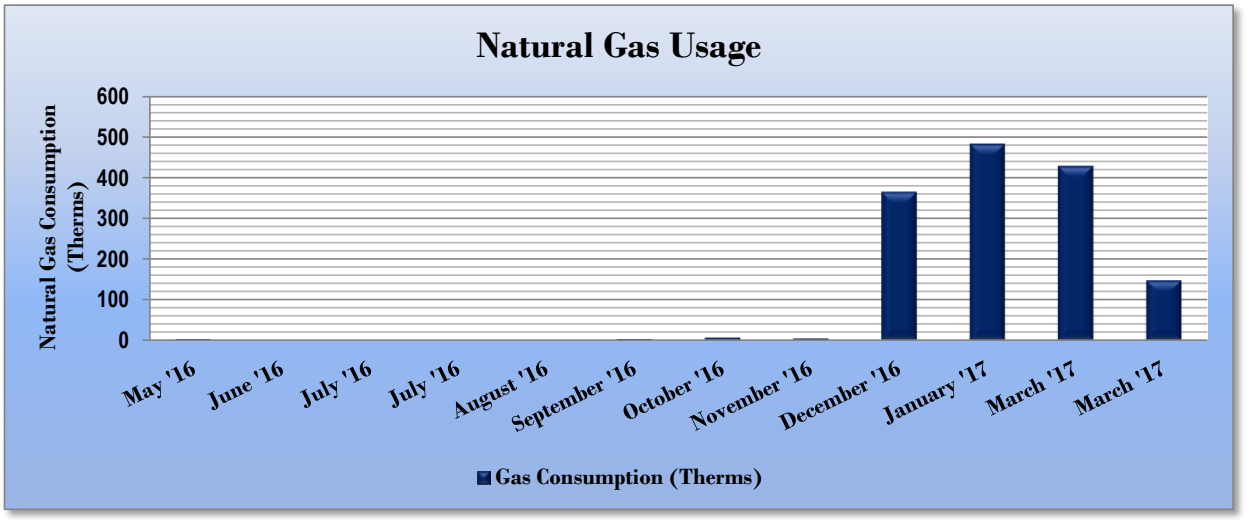


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Board of Education Office			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
5/17/16	30	3.2	$28
6/17/16	31	0.0	$25
7/19/16	32	0.0	$25
8/14/16	26	0.0	$20
9/13/16	30	0.0	$25
10/13/16	30	3.2	$29
11/8/16	26	6.4	$28
12/13/16	35	4.3	$36
1/12/17	30	364.8	$324
2/14/17	33	482.8	$420
3/20/17	34	428.5	$422
4/13/17	24	147.2	$112
Totals	**361**	**1,441**	**$1,493**
Annual	**365**	**1,456**	**$1,510**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Board of Education Office	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	315.6	148.1
Site Energy Use Intensity (kBtu/ft^2)	114.4	67.3

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Board of Education Office	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	289.9	148.1
Site Energy Use Intensity (kBtu/ft^2)	106.2	67.3

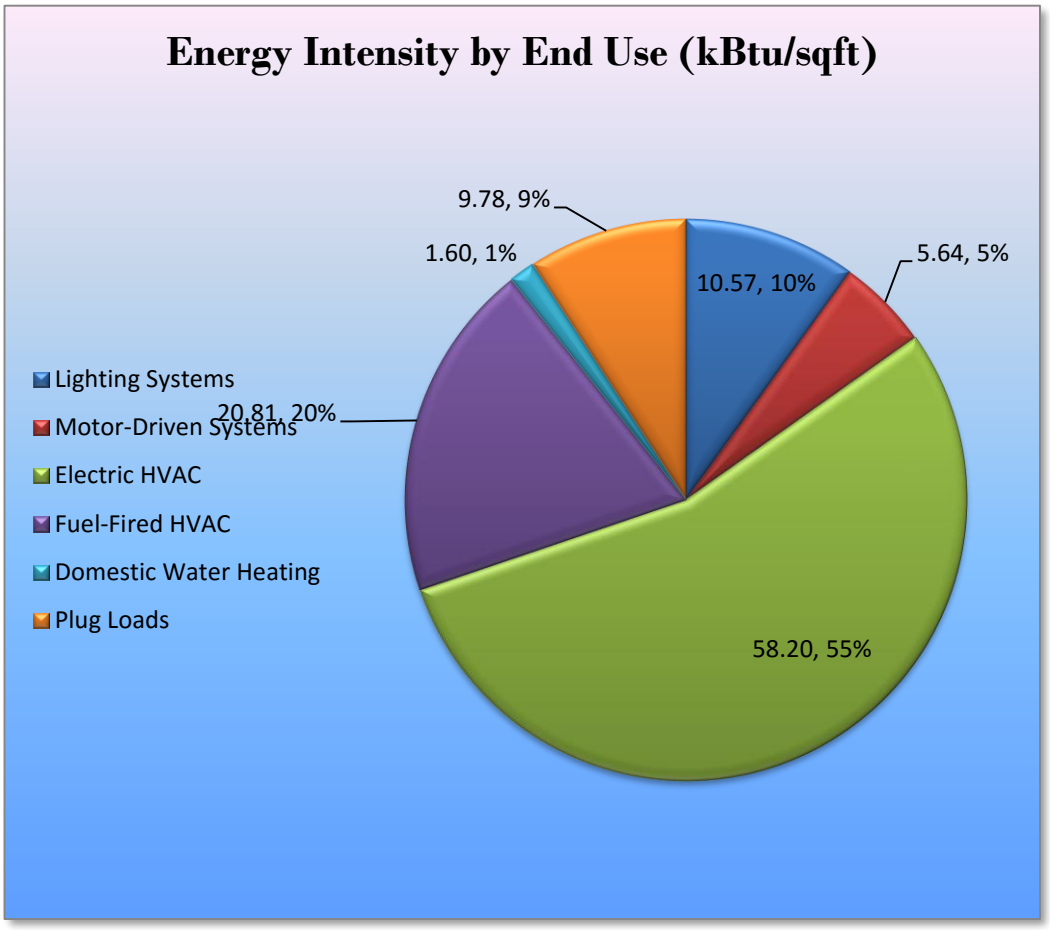
Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Currently, the building is unable to receive a score or a Statement of Energy Performance as the data period of new gas bills submitted does not coincide with the electric bill data period.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (kBtu/SF, %)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Board of Education Office regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**13,302**	**3.1**	**0.0**	**$1,476.98**	**$6,320.80**	**$1,175.00**	**$5,145.80**	**3.5**	**13,395**
ECM 1	Retrofit Fixtures with LED Lamps	13,302	3.1	0.0	$1,476.98	$6,320.80	$1,175.00	$5,145.80	3.5	13,395
Lighting Control Measures		**2,154**	**0.5**	**0.0**	**$239.21**	**$1,776.00**	**$260.00**	**$1,516.00**	**6.3**	**2,169**
ECM 2	Install Occupancy Sensor Lighting Controls	2,154	0.5	0.0	$239.21	$1,776.00	$260.00	$1,516.00	6.3	2,169
Domestic Water Heating Upgrade		**1,367**	**0.0**	**0.0**	**$151.80**	**$50.19**	**$0.00**	**$50.19**	**0.3**	**1,377**
ECM 3	Install Low-Flow Domestic Hot Water Devices	1,367	0.0	0.0	$151.80	$50.19	$0.00	$50.19	0.3	1,377
TOTALS		**16,823**	**3.7**	**0.0**	**$1,867.99**	**$8,146.99**	**$1,435.00**	**$6,711.99**	**3.6**	**16,941**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**13,302**	**3.1**	**0.0**	**$1,476.98**	**$6,320.80**	**$1,175.00**	**$5,145.80**	**3.5**	**13,395**
ECM 1	Retrofit Fixtures with LED Lamps	13,302	3.1	0.0	$1,476.98	$6,320.80	$1,175.00	$5,145.80	3.5	13,395

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	12,794	3.1	0.0	$1,420.65	$6,145.30	$1,145.00	$5,000.30	3.5	12,884
Exterior	507	0.1	0.0	$56.33	$175.50	$30.00	$145.50	2.6	511

Measure Description

We recommend retrofitting existing linear T8 tubes with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**2,154**	**0.5**	**0.0**	**$239.21**	**$1,776.00**	**$260.00**	**$1,516.00**	**6.3**	**2,169**
ECM 2	Install Occupancy Sensor Lighting Controls	2,154	0.5	0.0	$239.21	$1,776.00	$260.00	$1,516.00	6.3	2,169

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment**

Inventory & Recommendations for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 2: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,154	0.5	0.0	$239.21	$1,776.00	$260.00	$1,516.00	6.3	2,169

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, and offices. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 18 below.

Figure 18 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**1,367**	**0.0**	**0.0**	**$151.80**	**$50.19**	**$0.00**	**$50.19**	**0.3**	**1,377**
ECM 3	Install Low-Flow Domestic Hot Water Devices	1,367	0.0	0.0	$151.80	$50.19	$0.00	$50.19	0.3	1,377

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 3: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,367	0.0	0.0	$151.80	$50.19	$0.00	$50.19	0.3	1,377

Measure Description

We recommend installing low-flow domestic hot water devices in restrooms and kitchenette sinks to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot

water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

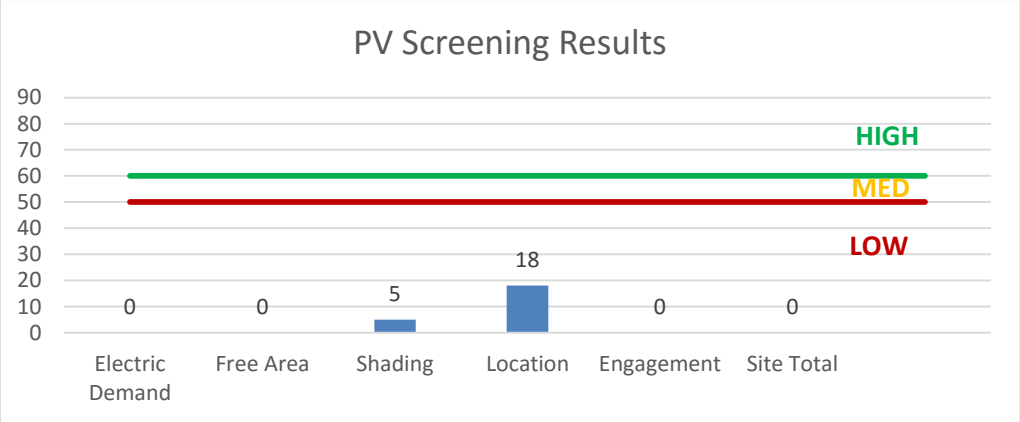
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a Low potential for installing a PV array.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 19 - Photovoltaic Screening



Potential	None	
System Potential	28	kW DC STC
Electric Generation	21,068	kWh/yr
Displaced Cost	$1,830	/yr
Installed Cost	$72,800	

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

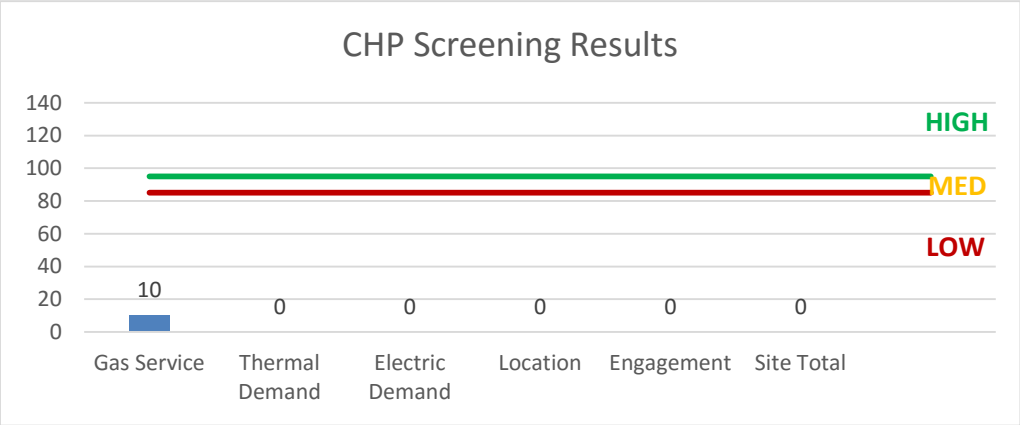
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

Figure 20 - Combined Heat and Power Screening



Please see Section **Error! Reference source not found.** for additional information in the Combined Heat & Power and Fuel Cell Program.

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 21 for a list of the eligible programs identified for each recommended ECM.

Figure 21 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Retrofit Fixtures with LED Lamps	x		x	
ECM 2	Install Occupancy Sensor Lighting Controls	x		x	
ECM 3	Install Low-Flow Domestic Hot Water Devices			x	

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers

Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main entrance	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.08	507	0.0	$56.33	$175.50	$30.00	2.58
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.24	903	0.0	$100.32	$526.50	$90.00	4.35
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.05	221	0.0	$24.52	$117.00	$20.00	3.96
Special Services	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,002	1.05	4,395	0.0	$488.06	$1,849.20	$350.00	3.07
Electrical room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,860	0.16	663	0.0	$73.57	$300.80	$60.00	3.27
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.03	110	0.0	$12.26	$58.50	$10.00	3.96
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.03	110	0.0	$12.26	$58.50	$10.00	3.96
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.03	110	0.0	$12.26	$58.50	$10.00	3.96
Mail room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.08	331	0.0	$36.78	$175.50	$30.00	3.96
Facilities manager	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,002	0.13	558	0.0	$61.98	$350.00	$60.00	4.68
Conference room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.21	883	0.0	$98.09	$468.00	$80.00	3.96
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.03	110	0.0	$12.26	$58.50	$10.00	3.96
Superintendent office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,002	0.40	1,674	0.0	$185.93	$871.60	$155.00	3.85
Assisstant superintendent office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,002	0.13	558	0.0	$61.98	$504.00	$75.00	6.92
Superintendent office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,002	0.07	279	0.0	$30.99	$233.00	$40.00	6.23
Men's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,002	0.07	279	0.0	$30.99	$233.00	$40.00	6.23
Custodian	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.03	110	0.0	$12.26	$58.50	$10.00	3.96
Women's restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,860	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,002	0.07	279	0.0	$30.99	$233.00	$40.00	6.23
Building Administrator's office	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,002	0.45	1,884	0.0	$209.17	$946.80	$170.00	3.71
Work room - BAO	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,860	0.04	166	0.0	$18.39	$75.20	$15.00	3.27
Payroll	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,002	0.05	209	0.0	$23.24	$191.20	$35.00	6.72
Assisstant BAO	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,002	0.05	209	0.0	$23.24	$191.20	$35.00	6.72
Board secretary	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,860	0.08	331	0.0	$36.78	$150.40	$30.00	3.27
Conference room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,860	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,860	0.08	331	0.0	$36.78	$150.40	$30.00	3.27
Main entrance	4	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	2,860	Relamp	No	4	LED Screw-In Lamps: Recessed fixture - 1 lamp	Wall Switch	8	2,860	0.06	241	0.0	$26.75	$62.00	$0.00	2.32

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main entrance	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Special Services	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Superintendent office	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Building Administrator's office	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Ceiling - Ductless head	VAV boxes	12	Supply Fan	0.3	60.0%	No	3,500	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	all school	3	Exhaust Fan	0.3	58.0%	No	2,745	No	58.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
IT closet	IT closet	1	Ductless Mini-Split AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Offices and mail room	2	Ductless Mini-Split HP	10.00	135.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference room	Conference room	1	Ductless Mini-Split AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof top	BOE offices	1	Furnace	135.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom attic	Restrooms and kitchen	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Men's Restroom, Women's restroom	6	Faucet Aerator (Lavatory)	2.50	1.00	0.00	1,277	0.0	$141.79	$43.02	$0.00	0.30
Kitchennette	1	Faucet Aerator (Kitchen)	2.50	2.20	0.00	90	0.0	$10.01	$7.17	$0.00	0.72

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
BOE office	41	Computer	145.0	Yes
BOE office	6	Laptop	45.0	Yes
BOE office	12	Printer - medium	20.0	Yes
BOE office	7	Printer - large	30.0	Yes
BOE office	2	Paper shredder	200.0	Yes
BOE office	1	Projector	200.0	Yes
BOE office	2	Microwave	900.0	No
BOE office	2	Refrigerator - Small	20.0	No
BOE office	1	Refrigerator - medium	30.0	No
BOE office	1	Refrigerator - Large	100.0	No
BOE office	3	Coffee machine	400.0	Yes
BOE office	1	Toaster	900.0	No
BOE office	1	Toaster oven	1,200.0	No
BOE office	4	Space heater	1,500.0	Yes
BOE office	1	Water dispenser	12.5	Yes
BOE office	2	Standing fan	60.0	Yes

Appendix B: EPA Statement of Energy Performance

Currently, the building is unable to receive a score or a Statement of Energy Performance as the data period of new gas bills submitted does not coincide with the electric bill data period.

Local Government Energy Audit:
Energy Audit Report

William Mason School

5 Shawnee Trail

Montville, NJ 07045

Montville Township BOE

September 26, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for William Mason School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

William Mason School is a 37,031 square foot elementary school comprised of a single floor with a partial basement. The partial basement consists of a mechanical space and two classrooms. The school contains various spaces types such as classrooms, media center, restrooms, offices, a mechanical space and gymnasium/all purpose room. The school is scheduled to operate between 8AM – 3PM during the weekdays. The school is open for sports and custodial activities till about 6PM.

Heating in the school is provided using two gas-fired condensing hot water boilers and cooling is provided using a combination of split AC units, window AC units and packaged AC units. Lighting at the William Mason School consists of T8 linear fluorescent fixtures in the hallways and classrooms. Smaller spaces such as the restrooms, boiler rooms and closets are lit using compact fluorescent lamps and incandescent lamps.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 4 measures which together represent an opportunity for William Mason School to reduce annual energy costs by roughly $8,480 and annual greenhouse gas emissions by 62,690 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 7.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce William Mason School's annual energy use by 7%.

Figure 1 – Previous 12 Month Utility Costs

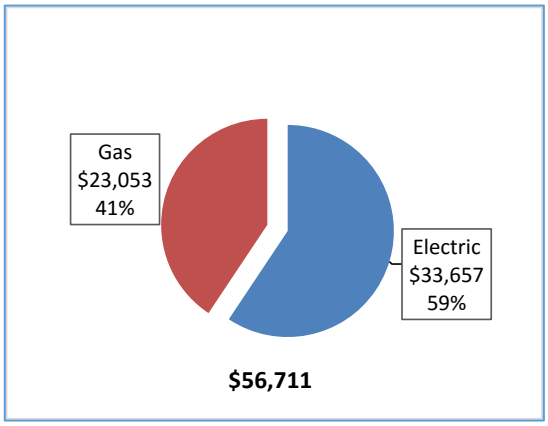
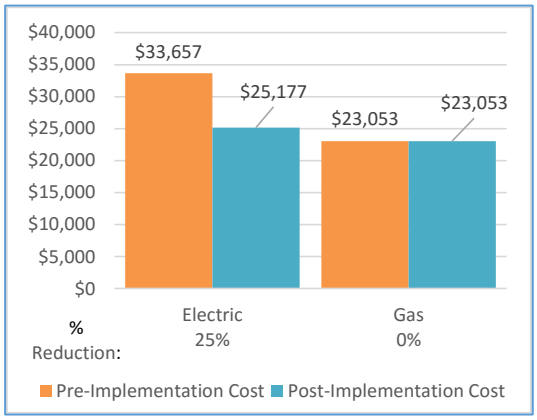


Figure 2 – Potential Post-Implementation Costs



A detailed description of William Mason School's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,542**	**10.3**	**0.0**	**$5,696.63**	**$28,068.28**	**$4,725.00**	**$23,343.28**	**4.1**	**40,826**
ECM 1	Install LED Fixtures	Yes	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,638	10.0	0.0	$5,429.10	$26,896.25	$4,425.00	$22,471.25	4.1	38,908
Lighting Control Measures			**5,344**	**1.4**	**0.0**	**$750.93**	**$5,400.00**	**$700.00**	**$4,700.00**	**6.3**	**5,382**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382
Variable Frequency Drive (VFD) Measures			**10,091**	**1.3**	**0.0**	**$1,417.88**	**$11,473.01**	**$0.00**	**$11,473.01**	**8.1**	**10,161**
ECM 4	Install VFDs on Hot Water Pumps	Yes	10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161
Electric Unitary HVAC Measures			**4,665**	**2.8**	**0.0**	**$655.54**	**$24,687.63**	**$1,518.00**	**$23,169.63**	**35.3**	**4,698**
	Install High Efficiency Electric AC	No	4,665	2.8	0.0	$655.54	$24,687.63	$1,518.00	$23,169.63	35.3	4,698
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$226.48**	**$230.00**	**$0.00**	**$230.00**	**1.0**	**1,623**
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	$226.48	$230.00	$0.00	$230.00	1.0	1,623
TOTAL OF ALL EVALUATED ECMS			**62,255**	**15.7**	**0.0**	**$8,747.45**	**$69,858.92**	**$6,943.00**	**$62,915.92**	**7.2**	**62,690**
TOTAL OF ALL RECOMMENDED ECMS			**57,589**	**13**	**0**	**$8,091.92**	**$45,171.29**	**$5,425.00**	**$39,746.29**	**4.9**	**57,992**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC Energy Services also identified 9 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at William Mason School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for William Mason School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important

because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	973-331-7100
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 13, 2017, TRC Energy Services performed an energy audit at William Mason School located in Montville, NJ. TRC Energy Services' team met with Ted Keane to review the facility operations and help focus our investigation on specific energy-using systems.

William Mason School is a 37,031 square foot facility comprised of one main level with a partial basement. The partial basement consists of a mechanical space and two classrooms. This is an elementary school and serves children from Pre-K to fifth grade. The school contains various spaces types such as classrooms, media center, restrooms, offices, a sub-mechanical space and gymnasium/all purpose room. The school is scheduled to operate between 8AM – 3PM during the weekdays. The school is open for sports and custodial activities till about 6PM.

The building was constructed in 1968. Heating in the school is provided using two gas-fired condensing hot water boilers and cooling is provided using a combination of split AC units, window AC units and packaged AC units. Lighting at the William Mason School consists of T8 linear tubes in the hallways and classrooms. Smaller spaces such as the restrooms, boiler rooms and closets are lit using compact fluorescent lamps and incandescent lamps.

2.3 Building Occupancy

The typical schedule is presented in the table below. This is a 10 month school. The school is scheduled to operate between 8AM – 3PM during the weekdays. The school is open for sports and custodial activities till about 6PM. There is limited to no activities in the weekend. During a typical day, there facility is occupied by approximately 60 full time staff (including admin, teachers and maintenance) and 300 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
William Mason School	Weekday	7:55AM - 2:55PM
William Mason School	Weekend	Mostly no operation

2.4 Building Envelope

The building is constructed using concrete block and steel structure have a brick façade. The corridor section connecting two sections of the building has aluminum framed glass façade. The building has a flat roof. One section of the roof has an EPDM coating and the other section seems to have an asphalt layer. Due to inclement weather on the day of the audit, the auditor did not have access to the roof. Other

resources were used to obtain this information. The dividing walls are concrete blocks in some spaces and sheet rocks in others. The windows in the building are double pane which are in good condition and show little sign of excessive infiltration. The entrance exterior door is glass with aluminum frame and other doors are aluminum door.

Image 1 Building envelope pictures

2.5 On-Site Generation

William Mason School does not have any on-site electric generation systems currently installed at the facility.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by 32-watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFLs). Most of the fixtures are 2-lamp, 3-lamp and 4-lamp 4-foot long troffers. A few restrooms have 2-foot U-bent T8 fixtures. The boiler rooms have a few 14-watt screw-in LED lamps. A small area such as offices, restrooms in classrooms and boiler rooms in the building spaces are primarily lit with 42-watt CFL lamps in recessed can or ceiling mount fixtures.

Lighting control in spaces like gym office and restrooms (in classrooms) is provided by occupancy sensors. In most spaces lighting control is provided using manual wall switches. The occupancy sensors are either wall mounted. The building's exterior lighting consists of a few compact fluorescent lamps fixtures and a few metal halide 175-watt lamp fixtures controlled using timers.

Image 2 Typical lighting at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Hot Water (or Steam) Heating System

The hot water system consists of two gas-fired condensing hot water boilers with an output capacity of 1720 MBh. The boiler has a combustion efficiency of 86%. The hot water is circulated using two 2hp and two 3hp constant speed pumps. Hot water is supplied at 180°F when the outside air temperature is below 20°F and the set point is modulated upto 120°F until the outside air temperature reaches 68°F. The boiler shuts down when the outside air temperature rises above this temperature. The space heating is controlled using pneumatic controls. The terminal units in the classrooms include the unit vents for distributing heated air in the respective spaces.

The boilers operate in a lead/lag configuration. Both boilers may be required during very cold weather. The boilers appeared to be in good condition and well maintained.

Image 3 Boilers, controls, and terminal units

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Direct Expansion Air Conditioning System (DX)

Space cooling in the old wing classrooms are provided by split AC units of capacities 2.5 or 3 tons based on the size of the classrooms. The older wing classrooms had AC installed within the last 4 years. The newer wing classrooms have DX coils (cooling capacity 2.5 ton or 3.5 ton) in the unit vents with condensers on the rooftop. These units are 17 years old and were installed at the time of construction of the addition. These units were evaluated for replacements. The office spaces are provided cooling using window AC units of 1 or 2 ton capacity and are approximately 10 years old. The new wing has a rooftop packaged unit of 5 tons. All units are controlled using thermostats in the respective zones.

Image 4 Typical space cooling and control units at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one gas fired and one electric water heater of tank capacities 50 gallons and 30 gallons respectively. The gas fired water heater (from Bradford White) has an input capacity of 40 MBh and an efficiency of 80%. The electric water heater (from State Premier) has an input capacity of 5.5kW. These water heaters are 3 years and 10 years old respectively and in good condition.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Building Plug Load

There are roughly 81 computer work stations and 15 laptops throughout the facility. Other plug loads in the classrooms and offices are printers, projectors, smart boards and chrome book carts. There are some kitchenette equipment in the facility such as the microwave, refrigerators, coffee machine, water dispensers etc., there is no centralized PC power management software installed.

There is one refrigerated vending machine in the teachers' lounge. There are no controls installed on the machine.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or lower, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

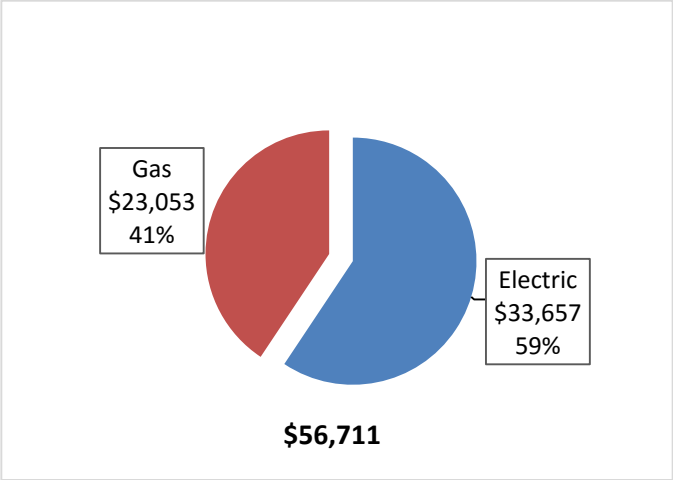
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for William Mason School		
Fuel	**Usage**	**Cost**
Electricity	239,536 kWh	$33,657
Natural Gas	21,167 Therms	$23,053
Total		**$56,711**

The current annual energy cost for this facility is $56,711 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.141/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Solutions. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

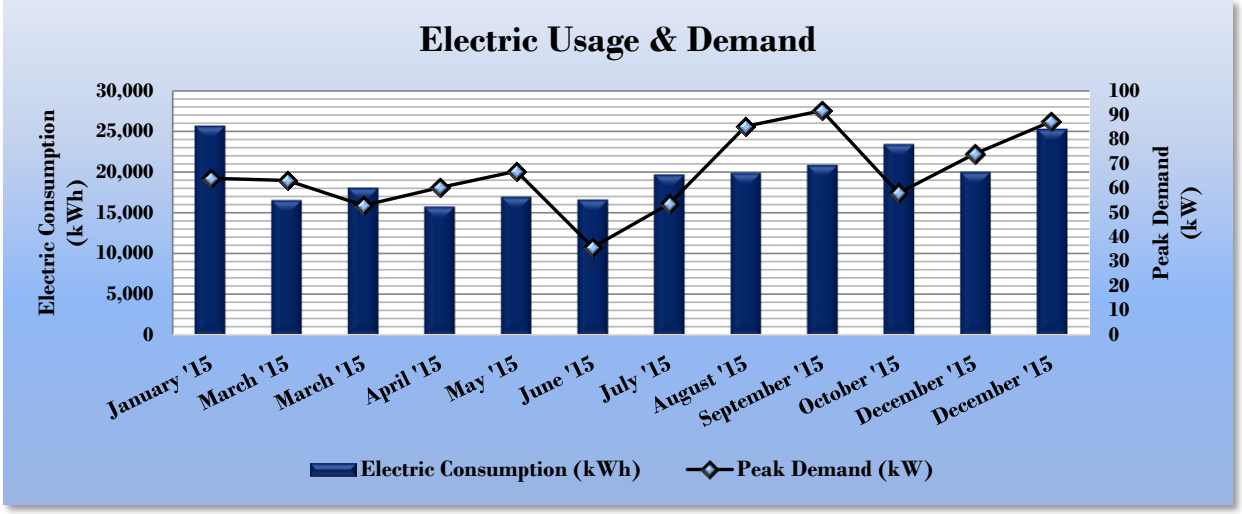


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for William Mason School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/13/15	30	25,680	64	$351	$2,860
3/17/15	32	16,560	63	$344	$2,145
4/13/15	27	18,080	53	$247	$2,183
5/12/15	29	15,760	60	$283	$1,994
6/11/15	30	16,960	67	$343	$2,178
7/15/15	34	16,640	36	$215	$2,215
8/13/15	29	19,680	54	$263	$4,375
9/10/15	28	19,920	85	$453	$4,934
10/10/15	30	20,880	92	$459	$2,374
11/9/15	30	23,440	58	$270	$2,736
12/16/15	37	20,000	74	$360	$2,489
1/13/16	28	25,280	87	$434	$3,081
Totals	**364**	**238,880**	**91.9**	**$4,022**	**$33,565**
Annual	**365**	**239,536**	**91.9**	**$4,033**	**$33,657**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.089/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

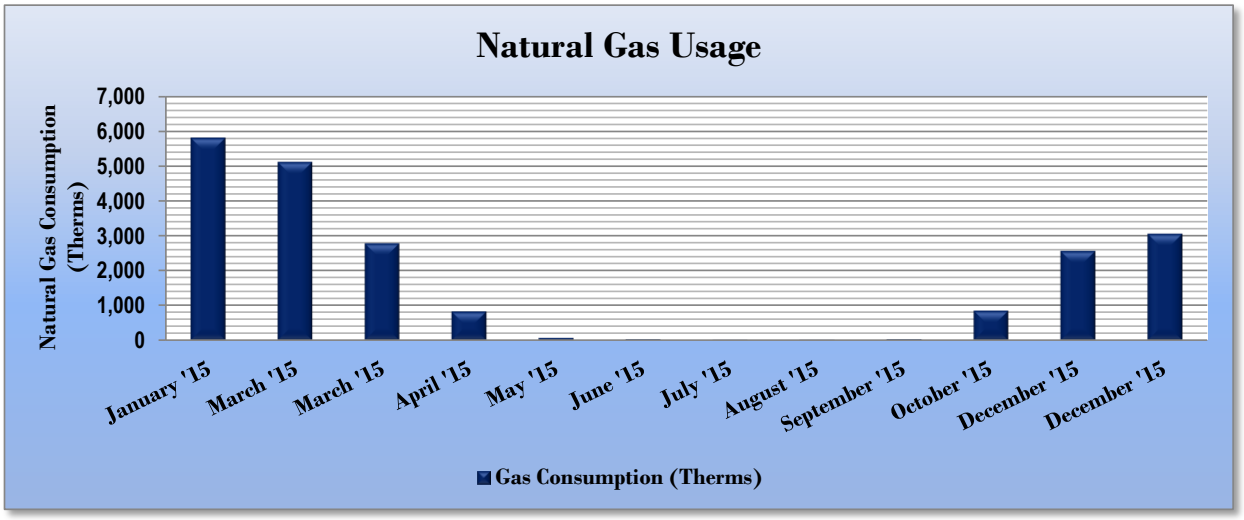


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for William Mason School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/13/15	30	5,799	$5,421
3/17/15	32	5,103	$4,866
4/13/15	27	2,772	$2,741
5/12/15	29	829	$1,132
6/11/15	30	70	$503
7/15/15	34	29	$469
8/13/15	29	14	$457
9/10/15	28	11	$454
10/10/15	30	25	$465
11/9/15	30	853	$1,116
12/16/15	37	2,556	$2,486
1/13/16	28	3,048	$2,880
Totals	**364**	**21,109**	**$22,990**
Annual	**365**	**21,167**	**$23,053**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	William Mason School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	129.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	79.2	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	William Mason School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	113.2	141.4
Site Energy Use Intensity (kBtu/ft^2)	74.1	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 62.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

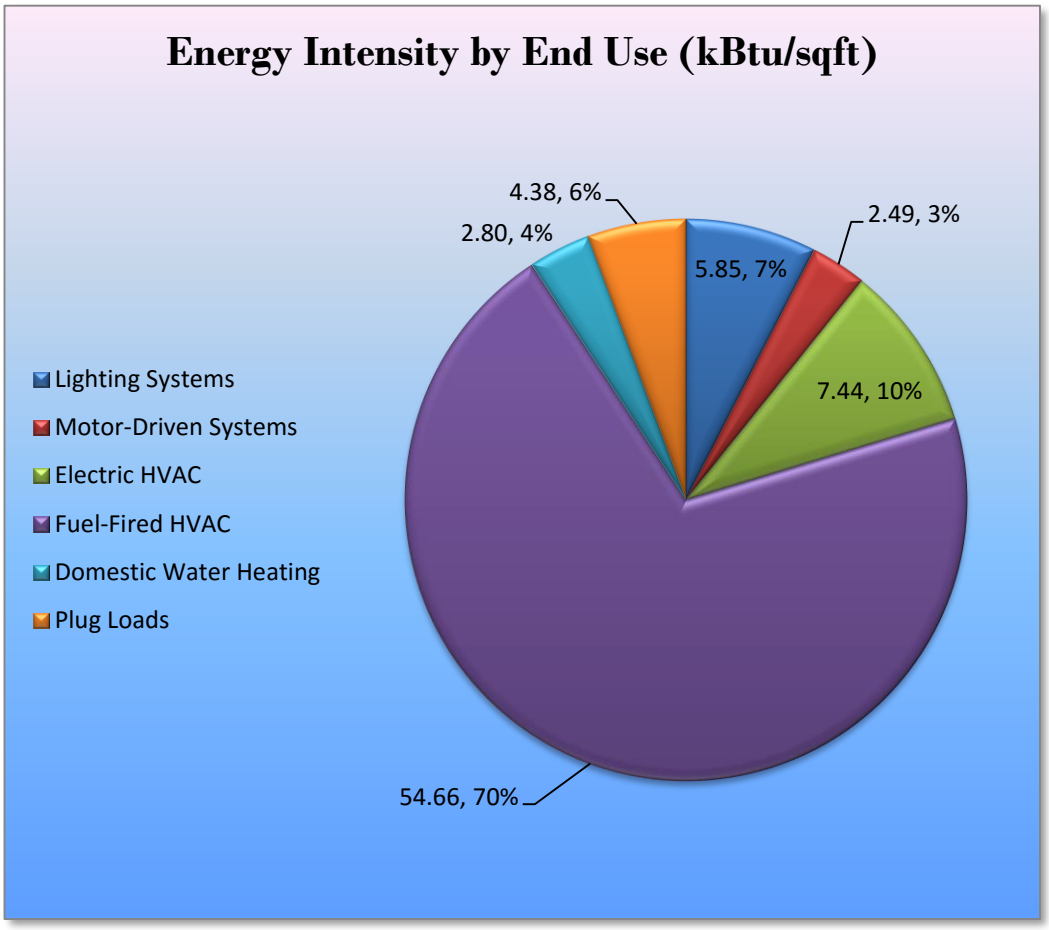
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (kBtu/SF, %)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the William Mason School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,542**	**10.3**	**0.0**	**$5,696.63**	**$28,068.28**	**$4,725.00**	**$23,343.28**	**4.1**	**40,826**
ECM 1	Install LED Fixtures	Yes	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,638	10.0	0.0	$5,429.10	$26,896.25	$4,425.00	$22,471.25	4.1	38,908
Lighting Control Measures			**5,344**	**1.4**	**0.0**	**$750.93**	**$5,400.00**	**$700.00**	**$4,700.00**	**6.3**	**5,382**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382
Variable Frequency Drive (VFD) Measures			**10,091**	**1.3**	**0.0**	**$1,417.88**	**$11,473.01**	**$0.00**	**$11,473.01**	**8.1**	**10,161**
ECM 4	Install VFDs on Hot Water Pumps	Yes	10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$226.48**	**$230.00**	**$0.00**	**$230.00**	**1.0**	**1,623**
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	$226.48	$230.00	$0.00	$230.00	1.0	1,623
TOTAL OF ALL RECOMMENDED ECMS			**57,589**	**13**	**0**	**$8,091.92**	**$45,171.29**	**$5,425.00**	**$39,746.29**	**4.9**	**57,992**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,542**	**10.3**	**0.0**	**$5,696.63**	**$28,068.28**	**$4,725.00**	**$23,343.28**	**4.1**	**40,826**
ECM 1	Install LED Fixtures	Yes	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,638	10.0	0.0	$5,429.10	$26,896.25	$4,425.00	$22,471.25	4.1	38,908

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917

Measure Description

We recommend replacing existing fixtures containing HID lamps on the exterior fixtures with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	37,671	9.9	0.0	$5,293.21	$26,309.13	$4,425.00	$21,884.13	4.1	37,935
Exterior	967	0.1	0.0	$135.89	$587.12	$0.00	$587.12	4.3	974

Measure Description

We recommend retrofitting existing incandescent and linear T8 tubes with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**5,344**	**1.4**	**0.0**	**$750.93**	**$5,400.00**	**$700.00**	**$4,700.00**	**6.3**	**5,382**
ECM 2	Install Occupancy Sensor Lighting Controls	5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 2: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all classrooms. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**10,091**	**1.3**	**0.0**	**$1,417.88**	**$11,473.01**	**$0.00**	**$11,473.01**	**8.1**	**10,161**
ECM 3	Install VFDs on Hot Water Pumps	10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about current motors systems and VFD recommendations.

ECM 3: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161

Measure Description

We recommend installing a variable frequency drives (VFD) to control the two 2hp and two 3hp hot water pumps distributing the boiler water. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Plug Load Equipment Control - Vending Machines

ECM 4: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$226.48	$230.00	$0.00	$230.00	1.0	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls on the vending machine located at the teachers' lounge to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 19 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**4,665**	**2.8**	**0.0**	**$655.54**	**$24,687.63**	**$1,518.00**	**$23,169.63**	**35.3**	**4,698**
Install High Efficiency Electric AC	4,665	2.8	0.0	$655.54	$24,687.63	$1,518.00	$23,169.63	35.3	4,698
TOTALS	**4,665**	**2.8**	**0.0**	**$655.54**	**$24,687.63**	**$1,518.00**	**$23,169.63**	**35.3**	**4,698**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,665	2.8	0.0	$655.54	$24,687.63	$1,518.00	$23,169.63	35.3	4,698

Measure Description

We evaluated replacing standard efficiency packaged air conditioning units (split systems – one 2.5 ton and 4 3.5 ton units) with high efficiency packaged air conditioning units on the newer wing classrooms that have DX coils on the unit vents and the condensers on the rooftop. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

Although the units are old enough to be evaluated for replacement, the payback (35.3 years) on this is more than the useful life of the units themselves as an individual measure. However, when these are installed with all of the other recommended measures, (see Figure 3) then the payback was calculated to be 7.2 years.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

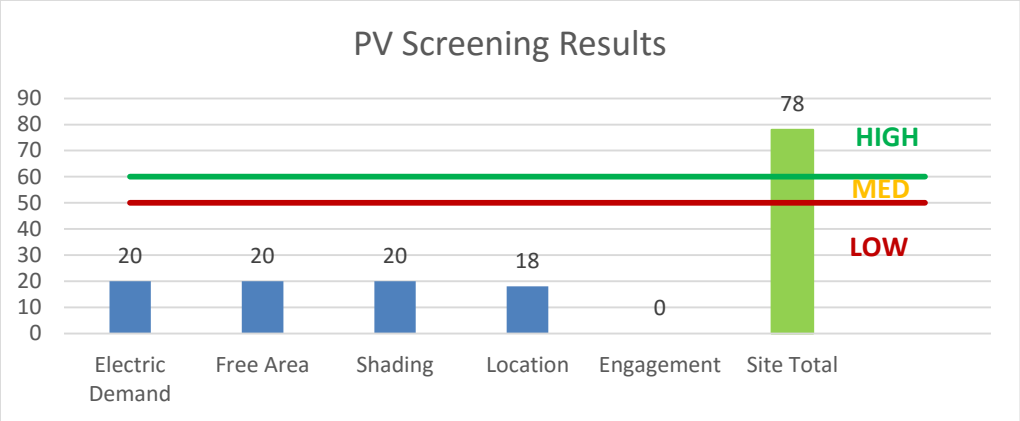
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If William Mason School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 19 - Photovoltaic Screening



Potential	High	
System Potential	50	kW DC STC
Electric Generation	59,569	kWh/yr
Displaced Cost	$5,180	/yr
Installed Cost	$130,000	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.6 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 20 for a list of the eligible programs identified for each recommended ECM.

Figure 20 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Install Occupancy Sensor Lighting Controls		x	x
ECM 4	Install VFDs on Hot Water Pumps	x		x
ECM 5	Vending Machine Control			

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific

eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a

manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	31	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	31	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.67	2,588	0.0	$363.67	$1,813.50	$310.00	4.13
Gym	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,200	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,200	0.29	1,133	0.0	$159.26	$761.07	$160.00	3.77
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.06	997	0.0	$140.13	$175.50	$30.00	1.04
Stairwell	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,760	0.08	1,169	0.0	$164.20	$252.80	$0.00	1.54
CR basement	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,200	0.13	501	0.0	$70.39	$300.80	$60.00	3.42
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,200	0.26	1,002	0.0	$140.77	$601.60	$120.00	3.42
Boys' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	880	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	880	0.06	100	0.0	$14.08	$150.40	$30.00	8.55
Girls' RR	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	880	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	616	0.12	190	0.0	$26.68	$495.60	$80.00	15.58
Room 18	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.49	1,899	0.0	$266.83	$1,172.40	$215.00	3.59
Room 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.49	1,899	0.0	$266.83	$1,172.40	$215.00	3.59
Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.17	668	0.0	$93.85	$468.00	$80.00	4.13
Principal's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.09	334	0.0	$46.92	$234.00	$40.00	4.13
Girls' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
Boys' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
CR 2	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
CR 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
CR 2B	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.36	1,372	0.0	$192.71	$1,030.50	$165.00	4.49
CR 3	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
CR 5	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
Faculty Lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.09	334	0.0	$46.92	$234.00	$40.00	4.13
Faculty RR	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.09	134	0.0	$18.77	$234.00	$40.00	10.34
Library	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	32	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.69	2,672	0.0	$375.40	$1,872.00	$320.00	4.13
CR 6	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
Custodian	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	208	0.04	16	0.0	$2.22	$117.00	$20.00	43.73
Electrical Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,200	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,200	0.07	283	0.0	$39.82	$190.27	$40.00	3.77

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Book Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.26	1,002	0.0	$140.77	$702.00	$120.00	4.13
CR 7,10,9,12,11	60	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	60	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	1.64	6,330	0.0	$889.44	$4,860.00	$775.00	4.59
Boys' RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.02	33	0.0	$4.69	$58.50	$10.00	10.34
Gym office	1	Compact Fluorescent: 1 Lamp	Occupancy Sensor	42	1,540	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	8	1,540	0.02	60	0.0	$8.46	$53.75	$0.00	6.35
Boiler Room	2	Compact Fluorescent: 1 Lamp	Wall Switch	42	2,200	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	8	2,200	0.04	172	0.0	$24.17	$107.51	$0.00	4.45
Boiler Room	1	LED Screw-In Lamps: 1 Lamp	Wall Switch	14	2,200	None	No	1	LED Screw-In Lamps: 1 Lamp	Wall Switch	14	2,200	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's office Lav	1	Compact Fluorescent: 3 Lamps	Wall Switch	78	880	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Wall Switch	11	880	0.04	68	0.0	$9.53	$161.26	$0.00	16.93
CR 1,2,2B - Lav	3	Compact Fluorescent: 3 Lamps	Occupancy Sensor	78	880	Relamp	No	3	LED Screw-In Lamps: 3 lamps	Occupancy Sensor	11	880	0.13	203	0.0	$28.58	$483.78	$0.00	16.93
Closet	1	Incandescent: 1 Lamp	Wall Switch	100	52	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	14	52	0.06	5	0.0	$0.72	$53.75	$5.00	67.47
CR 3 - Lav	1	Incandescent: 1 Lamp	Occupancy Sensor	60	880	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	8	880	0.03	53	0.0	$7.39	$53.75	$5.00	6.59
CR 14,3,28,29,30,31	72	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	72	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	1.97	7,596	0.0	$1,067.33	$5,832.00	$930.00	4.59
Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	26	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.56	2,171	0.0	$305.01	$1,521.00	$260.00	4.13
Hallway	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,200	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,200	0.04	162	0.0	$22.75	$192.80	$40.00	6.72
Girls' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
Boys' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
Girls' RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	880	0.02	29	0.0	$4.12	$63.20	$0.00	15.33
Boys' RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	880	0.02	29	0.0	$4.12	$63.20	$0.00	15.33
Custodian	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.04	167	0.0	$23.46	$117.00	$20.00	4.13
Faculty RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	880	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	880	0.02	29	0.0	$4.12	$63.20	$0.00	15.33
Room 32	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,200	0.26	1,002	0.0	$140.77	$601.60	$120.00	3.42
Electrical Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	208	0.04	16	0.0	$2.22	$117.00	$20.00	43.73
All school	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	6	Compact Fluorescent: 1 Lamp	Wall Switch	40	4,380	Relamp	No	6	LED Screw-In Lamps: 1 lamp	Wall Switch	8	4,380	0.13	967	0.0	$135.89	$587.12	$0.00	4.32

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Boiler	2	Heating Hot Water Pump	3.0	89.5%	No	2,745	No	89.5%	Yes	2	0.75	5,972	0.0	$839.09	$6,015.30	$0.00	7.17
Boiler room	Boiler	2	Heating Hot Water Pump	2.0	86.5%	No	2,745	No	86.5%	Yes	2	0.52	4,119	0.0	$578.79	$5,457.71	$0.00	9.43
Classrooms	Unit ventilators	14	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	HVV Reznor unit for new hallway	1	Supply Fan	3.0	88.5%	No	2,745	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	AHU - new wing	1	Supply Fan	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Exhaust fans - hallways and restrooms	6	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	Classrooms	10	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms	9	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Offices	3	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Offices	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Faculty office	Faculty office	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	New wing classrooms	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		16.00		No	0.42	707	0.0	$99.32	$3,740.55	$230.00	35.34
Rooftop	New wing classrooms	4	Split-System AC	3.50		Yes	4	Split-System AC	3.50		16.00		No	2.35	3,959	0.0	$556.21	$20,947.08	$1,288.00	35.34
Rooftop	New wing	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler	All school	2	Condensing Hot Water Boiler	1,720.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Kitchen and restroom	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical room	Kitchen and restroom	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
William Mason School	81	Computer	150.0	Yes
William Mason School	15	Laptop	45.0	Yes
William Mason School	10	Printer - Small	20.0	Yes
William Mason School	5	Printer - Medium	40.0	Yes
William Mason School	3	Printer - Larger	200.0	Yes
William Mason School	20	Projector	200.0	Yes
William Mason School	5	Microwave	1,000.0	No
William Mason School	2	Refrigerator - Medium	153.0	No
William Mason School	2	Refrigerator - Large	172.0	Yes
William Mason School	1	Refrigerator - double door	218.0	Yes
William Mason School	6	Coffee machine	900.0	Yes
William Mason School	19	Television - CRT	120.0	No
William Mason School	1	Television - LCD	100.0	No
William Mason School	1	Space Heater	1,500.0	Yes
William Mason School	1	Water Dispenser	500.0	Yes
William Mason School	2	Standing Fan	100.0	No
William Mason School	20	Smart board	5.0	Yes
William Mason School	6	Chrome Book Cart	40.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Faculty room	1	Refrigerated	Yes	0.00	1,612	0.0	$226.48	$230.00	$0.00	1.02

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

William Mason School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 37,031
Built: 1968

For Year Ending: February 29, 2016
Date Generated: September 05, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
William Mason School 5 Shawnee Trail Montville, New Jersey 07045	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5944673

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
73.3 kBtu/ft²

Source EUI
122.8 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,899,281 (70%)
Electric - Grid (kBtu)	813,376 (30%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	81.2
National Median Source EUI (kBtu/ft²)	136.1
% Diff from National Median Source EUI	-10%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	191

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

Local Government Energy Audit:
Energy Audit Report

Woodmont School

39 Woodmont Road

Pine Brook, NJ 07058

Montville Township Board of Education

October 13, 2017

Draft Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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Appendix A: Equipment Inventory & Recommendations

Appendix B: EPA Statement of Energy Performance

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Woodmont School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Woodmont School is a 43,062 square foot facility comprised of various space types such as classrooms, media center, cafeteria, kitchen, gymnasium, administration office, restrooms and a mechanical space in a partial basement. The building has one main floor and a partial basement that consists of two classrooms and a mechanical spaces. This is a 10 month school and it is open from 8:00 AM – 4:00 PM on weekdays. The school remains closed during the weekends.

Heating in the space is provided using two condensing hot water boilers. Space cooling is provided using a combination of split AC units, window AC units and roof top packaged units. Lighting in the building is predominantly using linear T8 tubes and compact fluorescent lamps in a few spaces. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 8 measures which together represent an opportunity for Woodmont School to reduce annual energy costs by roughly $11,894 and annual greenhouse gas emissions by 95,767 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 8.9 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Woodmont School's annual energy use by 12%.

Figure 1 – Previous 12 Month Utility Costs

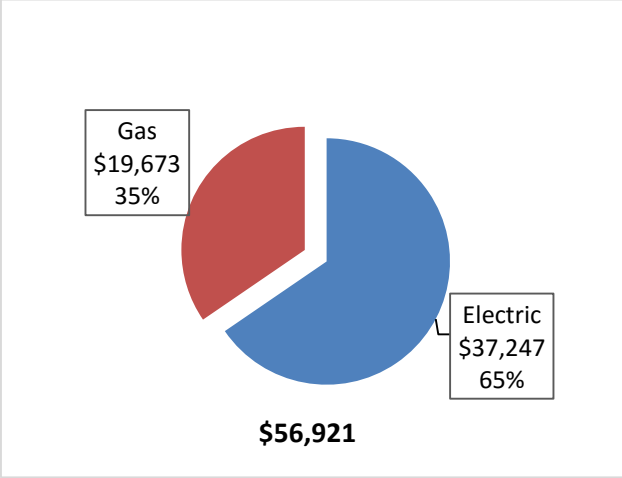
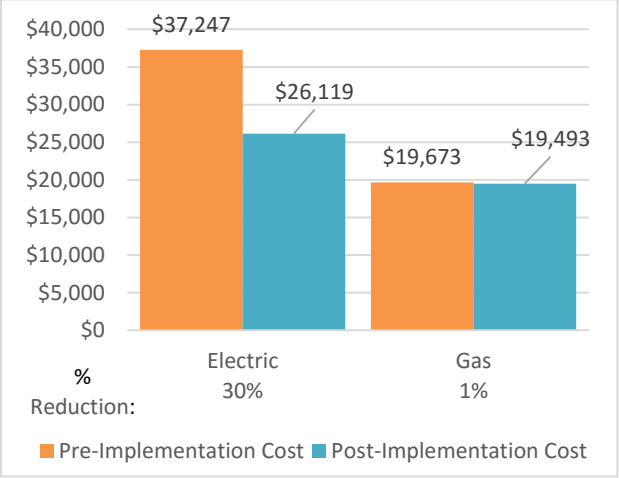


Figure 2 – Potential Post-Implementation Costs



A detailed description of Woodmont School's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**50,124**	**13.7**	**0.0**	**$6,293.01**	**$35,790.72**	**$5,830.00**	**$29,960.72**	**4.8**	**50,474**
ECM 1	Install LED Fixtures	Yes	5,319	0.7	0.0	$667.81	$1,562.71	$400.00	$1,162.71	1.7	5,356
ECM 2	Retrofit Fixtures with LED Lamps	Yes	44,805	13.0	0.0	$5,625.21	$34,228.01	$5,430.00	$28,798.01	5.1	45,118
Lighting Control Measures			**10,228**	**2.8**	**0.0**	**$1,284.18**	**$8,438.00**	**$1,285.00**	**$7,153.00**	**5.6**	**10,300**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	8,274	2.5	0.0	$1,038.81	$8,218.00	$1,105.00	$7,113.00	6.8	8,332
ECM 4	Install Daylight Dimming Controls	Yes	1,954	0.3	0.0	$245.37	$220.00	$180.00	$40.00	0.2	1,968
Variable Frequency Drive (VFD) Measures			**7,502**	**2.2**	**0.0**	**$941.91**	**$17,274.33**	**$0.00**	**$17,274.33**	**18.3**	**7,555**
ECM 5	Install VFDs on Hot Water Pumps	Yes	7,502	2.2	0.0	$941.91	$17,274.33	$0.00	$17,274.33	18.3	7,555
Electric Unitary HVAC Measures			**17,537**	**10.4**	**0.0**	**$2,201.79**	**$51,442.18**	**$2,102.50**	**$49,339.68**	**22.4**	**17,660**
	Install High Efficiency Electric AC	No	17,537	10.4	0.0	$2,201.79	$51,442.18	$2,102.50	$49,339.68	22.4	17,660
HVAC System Improvements			**6,300**	**1.4**	**0.0**	**$790.99**	**$2,750.00**	**$1,000.00**	**$1,750.00**	**2.2**	**6,344**
ECM 6	Install Dual Enthalpy Outside Economizer Control	Yes	6,300	1.4	0.0	$790.99	$2,750.00	$1,000.00	$1,750.00	2.2	6,344
Domestic Water Heating Upgrade			**0**	**0.0**	**15.5**	**$179.94**	**$71.70**	**$0.00**	**$71.70**	**0.4**	**1,810**
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	15.5	$179.94	$71.70	$0.00	$71.70	0.4	1,810
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$202.37**	**$230.00**	**$0.00**	**$230.00**	**1.1**	**1,623**
ECM 8	Vending Machine Control	Yes	1,612	0.0	0.0	$202.37	$230.00	$0.00	$230.00	1.1	1,623
TOTAL OF ALL EVALUATED ECMS			**93,304**	**30.5**	**15.5**	**$11,894.20**	**$115,996.93**	**$10,217.50**	**$105,779.43**	**8.9**	**95,767**
TOTAL OF ALL RECOMMENDED ECMS			**75,767**	**20**	**15**	**9,692**	**64,555**	**8,115**	**56,440**	**5.8**	**78,107**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC Energy Services also identified 8 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Woodmont School include:

- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to section 5.

On-Site Generation Measures

TRC Energy Services evaluated the potential for installing on-Site generation for Woodmont School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. For details on our evaluation and on-site generation potential, please refer to section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	(973) 331-7100
Rich Medwin	Maintenance Supervisor	richard.medwin@montville.net	(973) 567-9614
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 14, 2017, TRC Energy Services performed an energy audit at Woodmont School located in Pine Brook, NJ. TRC Energy Services' team met with Ted Keane to review the facility operations and help focus our investigation on specific energy-using systems.

Woodmont School is a 43,062 square foot facility comprised of various space types such as classrooms, media center, cafeteria, kitchen, gymnasium, administration office, restrooms and a mechanical space in a partial basement. The building has one main floor and a partial basement that consists of two classrooms and a mechanical spaces. This is a 10 month school and it is open from 8:00 AM – 4:00 PM on a regular day. The school remains closed during the weekends. The building was constructed in 1973 and additions done in 2000.

Heating in the space is provided using two condensing hot water boilers. Space cooling is provided using a combination of split AC units, window AC units and roof top packaged units. Lighting in the building is predominantly using linear T8 tubes and compact fluorescent lamps in a few spaces.

2.3 Building Occupancy

The typical schedule is presented in the table below. On regular days the schools is open from 8:00 AM – 4:00 PM and remains open till 6PM for after school activities. The facility is closed in the weekends. During a typical day, the facility is occupied by approximately 65 full time staff and 285 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Woodmont School	Weekday	8AM - 4PM
Woodmont School	Weekend	No operation

2.4 Building Envelope

The building is constructed of concrete block and a brick façade. it has a flat roof with different layers (EPDM membrane and asphalt layer) in different parts of the building. Due to inclement weather the auditor onsite did not have roof access. This information was obtained using other resources. The roof appears to be in good condition. The windows throughout the facility are double pane aluminum frame windows and are in good condition. The exterior doors are constructed of aluminum and in good condition and show no signs of air infiltration.

Image 1 Building envelope samples

2.5 On-Site Generation

Woodmont School does not have any on-site electric generation systems currently installed.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp, 3-lamp or 4-lamp 4-foot long troffers. A few spaces in the building such as a few hallways, main office, faculty lounge and some areas in the gym are primarily lit with 40-watt or 42-watt CFL lamps in recessed can ceiling fixtures.

Lighting control in most spaces is provided by manual wall switches. A couple of spaces such as the lavatory and faculty lounge are controlled using occupancy sensors. The occupancy sensors are either wall mounted. The building's exterior lighting is consists of metal halide 400-watt wall pack fixtures and 100 watt incandescent canopy fixtures that are controlled using timers.

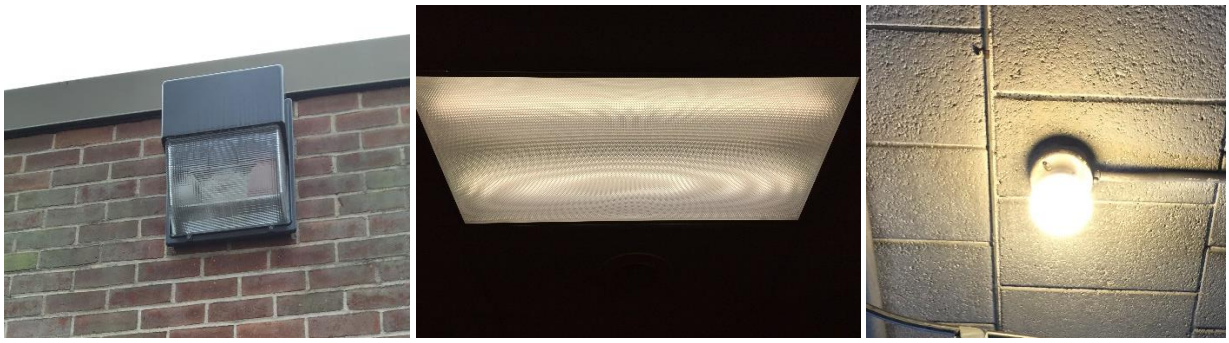


Image 2 Sample of lighting fixtures at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Hot Water (or Steam) Heating System

The hot water system consists of two gas-fired condensing hot water boilers of output capacity 1720 MBh and an efficiency of 86%. The boiler water is circulated throughout the facility using six constant speed pumps of motor capacities (2)1.5hp, (2)2hp, and (2)5hp. The terminal units in the school include unit ventilators and baseboard heaters for spaces such as the classrooms and hallways respectively. The heating and ventilating unit supplies heat to the gymnasium. The temperatures are controlled by

individual thermostats in the respective spaces and the hot water supply is controlled via pneumatic controls.

When the temperature is less than the set-point, the valve opens for the hot water coils and the supply fans in the heating zones supply heated air to the respective spaces. When the temperatures reaches the set point, the valves shuts down. This valve action is caused by the pneumatic controls in the building. Hot water is supplied at 180°F when the outside air temperature is below 20°F and the setpoint is reset to 120°F when the outside air is 68°F. The boiler is shut down at 70°F.

The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather. The boilers are 13 years old, in good condition and well maintained.

Image 3 Boiler, controls, terminal unit and circulating pump samples at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Direct Expansion Air Conditioning System (DX)

The space cooling in the space is provided using a mixture of equipment such as the split AC units, rooftop packaged units and window AC units.

The classrooms are predominantly cooled using split AC units ((4)2 ton, (6)3 ton and (6)3.5 ton) and packaged units (one 5 ton and three 7.5 ton). The classrooms in the newer addition have unit ventilators with DX coils for cooling and hot water coils for heating.. In some of the classrooms, the split units are 2-3 years old while in others they are 18 years old. One 5 ton and three 7.5 ton Carrier packaged units serving the classrooms are 34 years old and have been evaluated for replacement.

The main offices are provided cooling using window AC units. The gym is cooled using 5 split AC units of 3 ton capacity. These are 2 years old and in good condition. All of the units are controlled using thermostats at the individual spaces.

Image 4 Sample of cooling equipment and controls at the facility

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one gas fired water heater from Rheem of input capacity 60 MBh and a tank capacity of 48 gallons. This water heater has an efficiency of 63%. The art room sink has one tankless water heater from Bosch of input capacity of 1.4kW. This supplies hot water to the restrooms and sinks at the facility.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Building Plug Load

There are roughly 93 computer work stations and 22 laptops throughout the facility. The students also use chrome books while at school which are charged using the Chromebook carts. There are smart boards and projectors in about every classroom. Other offices, copy room and faculty lounge in the school has equipment such as printers, refrigerators, toasters, toaster oven, television, coffee machine etc., There is no centralized PC power management software installed.

There is one IT closet in the school which is cooled using a dedicated split AC system. There is also one refrigerated vending machine in the faculty machine.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

3 SITE ENERGY USE AND COSTS

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

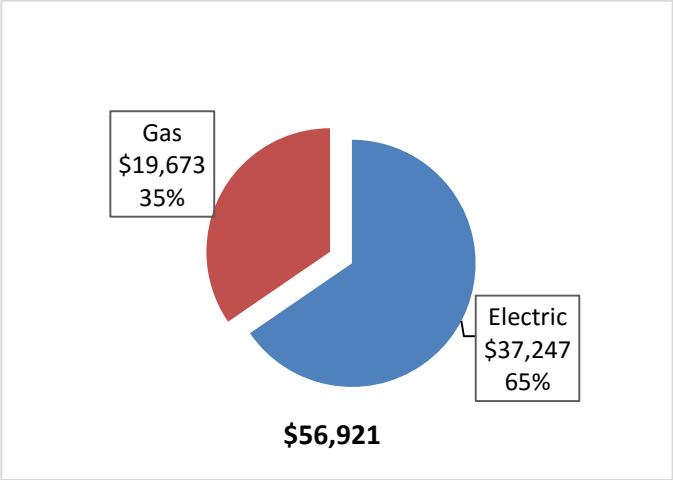
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Woodmont School		
Fuel	**Usage**	**Cost**
Electricity	296,675 kWh	$37,247
Natural Gas	16,905 Therms	$19,673
Total		**$56,921**

The current annual energy cost for this facility is $56,921 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.126/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Sol. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

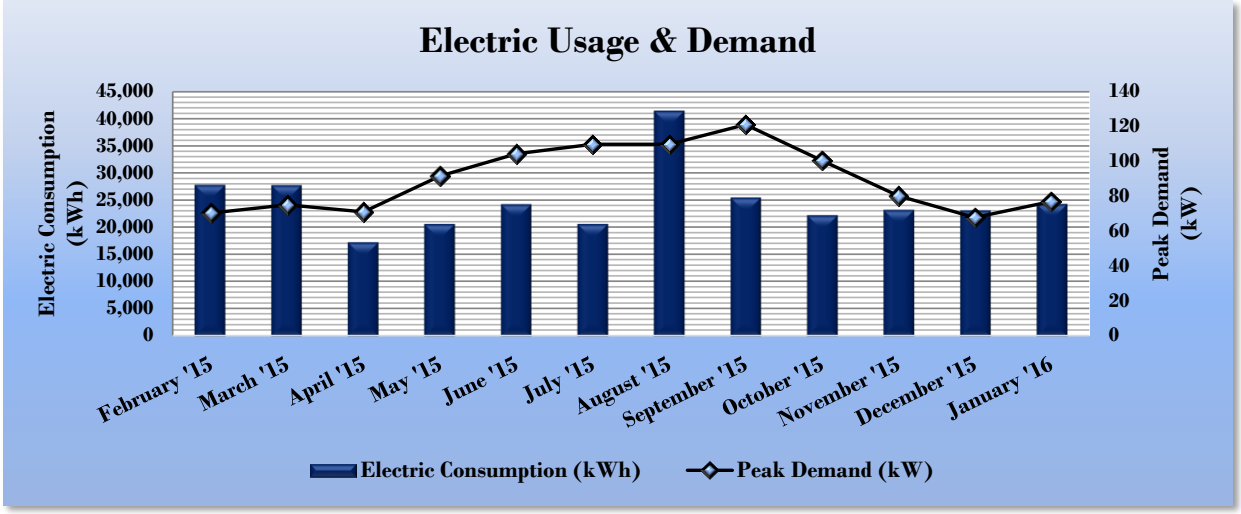


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Woodmont School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/18/15	30	27,845	70	$390	$3,325
3/20/15	30	27,765	75	$421	$2,875
4/21/15	32	17,289	71	$367	$2,304
5/19/15	28	20,647	92	$458	$2,721
6/19/15	31	24,246	104	$567	$3,190
7/22/15	33	20,642	110	$600	$2,254
8/21/15	30	41,442	110	$528	$5,671
9/23/15	33	25,522	121	$668	$3,416
10/22/15	29	22,247	100	$507	$2,934
11/20/15	29	23,205	80	$394	$2,911
12/21/15	31	23,127	68	$376	$2,840
1/21/16	31	24,324	77	$376	$3,010
Totals	**367**	**298,301**	**121.1**	**$5,650**	**$37,452**
Annual	**365**	**296,675**	**121.1**	**$5,619**	**$37,247**

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.164/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

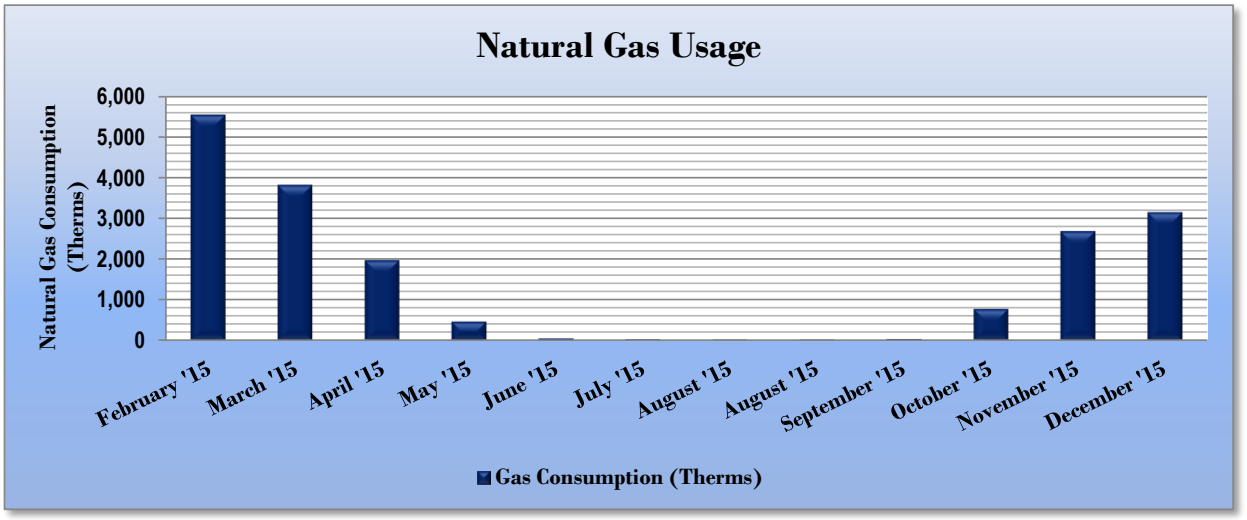


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Woodmont School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/18/15	30	5,526	$5,231
3/23/15	30	3,807	$3,904
4/21/15	32	1,966	$2,128
5/18/15	59	459	$881
6/19/15	33	44	$536
7/20/15	30	24	$519
8/18/15	33	16	$513
9/15/15	29	17	$514
10/14/15	29	34	$528
11/12/15	31	771	$1,108
12/14/15	31	2,679	$2,639
1/15/16	32	3,136	$3,005
Totals	**399**	**18,480**	**$21,506**
Annual	**365**	**16,905**	**$19,673**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Woodmont School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	115.0	141.4
Site Energy Use Intensity (kBtu/ft^2)	62.8	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Woodmont School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	97.0	141.4
Site Energy Use Intensity (kBtu/ft^2)	56.8	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has an energy star score of 57.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

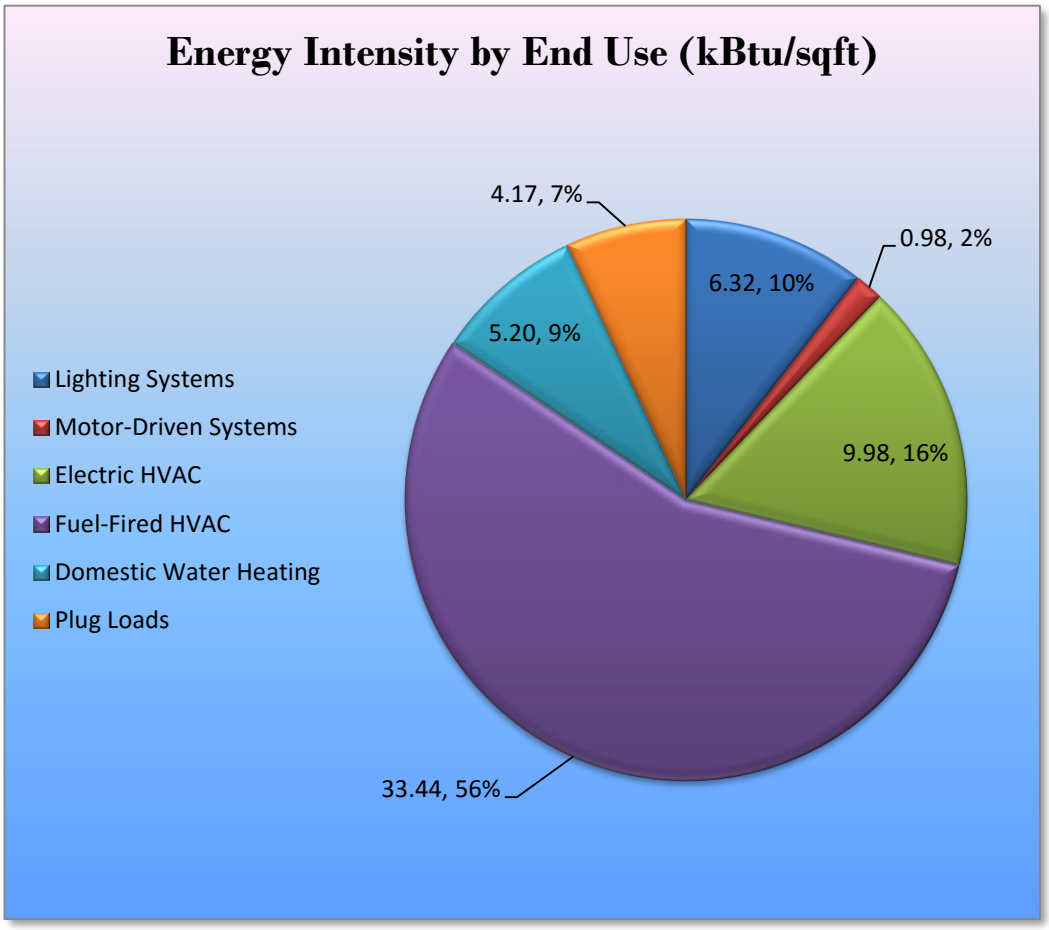
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (kBtu/SF, %)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Woodmont School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**50,124**	**13.7**	**0.0**	**$6,293.01**	**$35,790.72**	**$5,830.00**	**$29,960.72**	**4.8**	**50,474**
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ECM 5	Install VFDs on Hot Water Pumps	7,502	2.2	0.0	$941.91	$17,274.33	$0.00	$17,274.33	18.3	7,555
Electric Unitary HVAC Measures		**17,537**	**10.4**	**0.0**	**$2,201.79**	**$51,442.18**	**$2,102.50**	**$49,339.68**	**22.4**	**17,660**
ECM 6	Install Dual Enthalpy Outside Economizer Control	6,300	1.4	0.0	$790.99	$2,750.00	$1,000.00	$1,750.00	2.2	6,344
Domestic Water Heating Upgrade		**0**	**0.0**	**15.5**	**$179.94**	**$71.70**	**$0.00**	**$71.70**	**0.4**	**1,810**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	15.5	$179.94	$71.70	$0.00	$71.70	0.4	1,810
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$202.37**	**$230.00**	**$0.00**	**$230.00**	**1.1**	**1,623**
ECM 8	Vending Machine Control	1,612	0.0	0.0	$202.37	$230.00	$0.00	$230.00	1.1	1,623
TOTAL OF ALL RECOMMENDED ECMS		**75,767**	**20**	**15**	**9,692**	**64,555**	**8,115**	**56,440**	**5.8**	**78,107**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**50,124**	**13.7**	**0.0**	**$6,293.01**	**$35,790.72**	**$5,830.00**	**$29,960.72**	**4.8**	**50,474**
ECM 1	Install LED Fixtures	5,319	0.7	0.0	$667.81	$1,562.71	$400.00	$1,162.71	1.7	5,356
ECM 2	Retrofit Fixtures with LED Lamps	44,805	13.0	0.0	$5,625.21	$34,228.01	$5,430.00	$28,798.01	5.1	45,118

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	5,319	0.7	0.0	$667.81	$1,562.71	$400.00	$1,162.71	1.7	5,356

Measure Description

We recommend replacing existing exterior fixtures containing HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	42,639	12.7	0.0	$5,353.28	$33,738.75	$5,405.00	$28,333.75	5.3	42,937
Exterior	2,166	0.3	0.0	$271.93	$489.27	$25.00	$464.27	1.7	2,181

Measure Description

We recommend retrofitting existing incandescent lamps and linear tubes (T8/T5) lighting technologies (in classrooms, hallways, restrooms, gymnasiums etc) with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**10,228**	**2.8**	**0.0**	**$1,284.18**	**$8,438.00**	**$1,285.00**	**$7,153.00**	**5.6**	**10,300**
ECM 3	Install Occupancy Sensor Lighting Controls	8,274	2.5	0.0	$1,038.81	$8,218.00	$1,105.00	$7,113.00	6.8	8,332
ECM 4	Install Daylight Dimming Controls	1,954	0.3	0.0	$245.37	$220.00	$180.00	$40.00	0.2	1,968

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
8,274	2.5	0.0	$1,038.81	$8,218.00	$1,105.00	$7,113.00	6.8	8,332

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, classrooms and offices areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 4: Install Daylight Dimming Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,954	0.3	0.0	$245.37	$220.00	$180.00	$40.00	0.2	1,968

Measure Description

We recommend installing daylight dimming controls that use photosensors to the exterior fixtures that are currently controlled using timers, to reduce electric lighting in areas when ample daylight lighting is present. Photosensor controls are recommended for fixtures that are adjacent to windows that receive lots of sunlight. As sunlight level increase in the room, fixture lighting is decreased or turned off. This measure reduces energy use in spaces where sufficient lighting levels can be met by ambient daylight.

Optimum light levels and the method of dimming should be determined during lighting design. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**7,502**	**2.2**	**0.0**	**$941.91**	**$17,274.33**	**$0.00**	**$17,274.33**	**18.3**	**7,555**
ECM 5	Install VFDs on Hot Water Pumps	7,502	2.2	0.0	$941.91	$17,274.33	$0.00	$17,274.33	18.3	7,555

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about current motors systems and VFD recommendations.

ECM 5: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
7,502	2.2	0.0	$941.91	$17,274.33	$0.00	$17,274.33	18.3	7,555

Measure Description

We recommend installing a variable frequency drives (VFD) to control all hot water pumps (two 1.5hp, two 2hp and two 5hp motors). This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Please note that all boiler do not have the capability of having VFD installed on them. It is important to check with the manufacturer before going through with the installation.

4.1.4 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 19 below.

Figure 19 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**6,300**	**1.4**	**0.0**	**$790.99**	**$2,750.00**	**$1,000.00**	**$1,750.00**	**2.2**	**6,344**
ECM 6	Install Dual Enthalpy Outside Economizer Control	6,300	1.4	0.0	$790.99	$2,750.00	$1,000.00	$1,750.00	2.2	6,344

ECM 6: Install Dual-Enthalpy Economizers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
6,300	1.4	0.0	$790.99	$2,750.00	$1,000.00	$1,750.00	2.2	6,344

Measure Description

We recommend installing dual enthalpy economizers on the three 7.5 ton Carrier rooftop packaged units and the one 5 ton Carrier rooftop unit serving the classrooms. Dual enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy. Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

These AC units are also evaluated for replacement. If the facility decides to replace the units it is recommended to select the option of having inbuilt enthalpy economizers on them.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 20 below.

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**15.5**	**$179.94**	**$71.70**	**$0.00**	**$71.70**	**0.4**	**1,810**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	15.5	$179.94	$71.70	$0.00	$71.70	0.4	1,810

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 7: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	15.5	$179.94	$71.70	$0.00	$71.70	0.4	1,810

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.6 Plug Load Equipment Control - Vending Machines

ECM 8: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$202.37	$230.00	$0.00	$230.00	1.1	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls on the refrigerated vending machines located at the faculty lounge to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 21 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**17,537**	**10.4**	**0.0**	**$2,201.79**	**$51,442.18**	**$2,102.50**	**$49,339.68**	**22.4**	**17,660**
Install High Efficiency Electric AC	17,537	10.4	0.0	$2,201.79	$51,442.18	$2,102.50	$49,339.68	22.4	17,660
TOTALS	**17,537**	**10.4**	**0.0**	**$2,201.79**	**$51,442.18**	**$2,102.50**	**$49,339.68**	**22.4**	**17,660**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
17,537	10.4	0.0	$2,201.79	$51,442.18	$2,102.50	$49,339.68	22.4	17,660

Measure Description

We evaluated replacing standard efficiency packaged air conditioning units (7.5 ton and 5 ton Carrier units) with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

Although these units are old enough to be replaced, the pay back on replacing these units are more than the useful life of the equipment themselves (as an individual measure). However if this measure is combined with the other recommended energy conservation measures, the payback period of the whole package is only 8.9 years as shown in figure 3.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

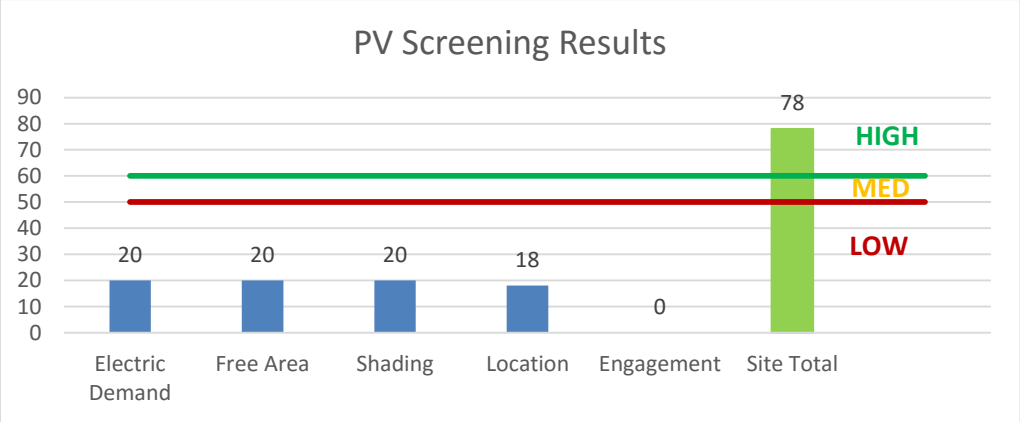
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof may be feasible. If Woodmont School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 22 - Photovoltaic Screening



Potential	High	
System Potential	75	kW DC STC
Electric Generation	89,353	kWh/yr
Displaced Cost	$7,770	/yr
Installed Cost	$195,000	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

In our assessment, this school is not a good candidate for demand response program.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 23 for a list of the eligible programs identified for each recommended ECM.

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Install Occupancy Sensor Lighting Controls	x		x
ECM 4	Install Daylight Dimming Controls	x		x
ECM 5	Install VFDs on Hot Water Pumps		x	x
ECM 6	Install Dual Enthalpy Outside Economizer Control			x
ECM 7	Install Low-Flow Domestic Hot Water Devices			x
ECM 8	Vending Machine Control			x

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific

eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of DI program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since DI offers a free assessment of eligible measures, DI is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a

manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO";
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a Third Party Supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.02	75	0.0	$9.43	$58.50	$10.00	5.14
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.09	291	0.0	$36.59	$234.00	$40.00	5.30
Room LL1	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.44	1,473	0.0	$184.96	$1,206.00	$195.00	5.47
Room LL2	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.44	1,473	0.0	$184.96	$1,206.00	$195.00	5.47
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.06	997	0.0	$125.21	$175.50	$30.00	1.16
Gym	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,920	0.29	989	0.0	$124.19	$761.07	$160.00	4.84
Hallway	19	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	19	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,920	0.36	1,217	0.0	$152.74	$1,200.80	$0.00	7.86
Main office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	0.19	710	0.0	$89.19	$451.20	$90.00	4.05
Principal's office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.22	798	0.0	$100.18	$584.00	$100.00	4.83
Nurse's office	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,080	None	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,456	0.01	31	0.0	$3.92	$116.00	$20.00	24.50
Faculty Bath	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	780	0.02	26	0.0	$3.27	$63.20	$0.00	19.35
Boys' restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	780	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	546	0.19	263	0.0	$33.06	$496.53	$100.00	11.99
Girls' restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	780	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	546	0.19	263	0.0	$33.06	$496.53	$100.00	11.99
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.17	583	0.0	$73.18	$468.00	$80.00	5.30
CR 4	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.36	1,197	0.0	$150.28	$1,030.50	$165.00	5.76
CR 3	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.77	2,578	0.0	$323.67	$1,908.00	$315.00	4.92
Lavatory	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	660	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	660	0.01	13	0.0	$1.67	$35.90	$5.00	18.53
Computer lab	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.44	1,473	0.0	$184.96	$1,206.00	$195.00	5.47
Hallway	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.39	1,312	0.0	$164.66	$1,053.00	$180.00	5.30
CR 5	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$138.72	$972.00	$155.00	5.89
Custodian Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$18.87	$117.00	$20.00	5.14
Room 6	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$138.72	$972.00	$155.00	5.89
CR 7,8,9,10,11,12,13	84	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	84	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	2.30	7,734	0.0	$971.02	$6,804.00	$1,085.00	5.89
Hallway	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	19	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.41	1,384	0.0	$173.81	$1,111.50	$190.00	5.30
CR 15,14,17,16	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.31	4,420	0.0	$554.87	$3,888.00	$620.00	5.89

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.08	112	0.0	$14.09	$445.50	$65.00	27.01
Girls' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.14	196	0.0	$24.56	$445.50	$65.00	15.49
Faculty lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.11	368	0.0	$46.24	$350.00	$60.00	6.27
Room 18	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.16	552	0.0	$69.36	$467.00	$80.00	5.58
Room 21	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$34.68	$291.50	$50.00	6.96
Room 20	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.49	1,657	0.0	$208.08	$1,323.00	$215.00	5.32
Room 23	43	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	43	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.18	3,959	0.0	$497.07	$2,785.50	$465.00	4.67
Room 24	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.44	1,473	0.0	$184.96	$1,206.00	$195.00	5.47
Boiler room	7	Incandescent: 1 lamp	Wall Switch	40	1,980	Relamp	No	7	LED Screw-In Lamps: 1 lamp	Wall Switch	8	1,980	0.15	510	0.0	$64.04	$376.27	$35.00	5.33
Hallway	16	Compact Fluorescent: 1 lamp	Wall Switch	42	1,920	Relamp	No	16	LED Screw-In Lamps: 1 lamp	Wall Switch	8	1,920	0.36	1,201	0.0	$150.80	$860.05	$0.00	5.70
Room 4-1	1	Compact Fluorescent: 3 lamps	Wall Switch	78	1,920	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Wall Switch	8	1,920	0.05	155	0.0	$19.40	$161.26	$0.00	8.31
Room 4-2	1	Compact Fluorescent: 3 lamps	Wall Switch	78	1,920	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Wall Switch	8	1,920	0.05	155	0.0	$19.40	$161.26	$0.00	8.31
Gym	2	Compact Fluorescent: 1 lamp	Wall Switch	42	1,920	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	8	1,920	0.04	150	0.0	$18.85	$107.51	$0.00	5.70
Main office	1	Compact Fluorescent: 3 lamps	Wall Switch	78	2,080	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Wall Switch	8	2,080	0.05	167	0.0	$21.02	$161.26	$0.00	7.67
Faculty Lounge lav	1	Compact Fluorescent: 3 lamps	Occupancy Sensor	54	660	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Occupancy Sensor	8	660	0.03	35	0.0	$4.38	$161.26	$0.00	36.79
Room 18	1	Compact Fluorescent: 1 lamp	Wall Switch	32	1,920	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	8	1,920	0.02	53	0.0	$6.65	$53.75	$0.00	8.08
All School	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.17	583	0.0	$73.18	$468.00	$80.00	5.30
CR 25,26	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.98	3,315	0.0	$416.15	$2,344.80	$430.00	4.60
Room 28	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.12	414	0.0	$52.02	$341.60	$65.00	5.32
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,980	0.03	113	0.0	$14.15	$75.20	$15.00	4.25
Room 27	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	0.10	328	0.0	$41.17	$225.60	$45.00	4.39
Room 27	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,920	0.02	64	0.0	$8.04	$63.20	$0.00	7.86
Lavatory	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	780	0.02	26	0.0	$3.27	$63.20	$0.00	19.35
Room 30	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.49	1,657	0.0	$208.08	$1,172.40	$215.00	4.60

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 29	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.49	1,657	0.0	$208.08	$1,172.40	$215.00	4.60
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.15	$58.50	$10.00	5.30
Exterior lights	4	Metal Halide: (1) 400W Lamp	Wall Switch	458	4,380	Fixture Replacement	Yes	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	194	2,190	0.95	7,273	0.0	$913.18	$1,782.71	$580.00	1.32
Exterior lights	5	Incandescent: 1 lamp	Wall Switch	100	4,380	Relamp	No	5	LED Screw-In Lamps: 1 lamp	Wall Switch	14	4,380	0.28	2,166	0.0	$271.93	$489.27	$25.00	1.71

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Boiler	2	Heating Hot Water Pump	1.5	86.5%	No	1,200	No	86.5%	Yes	2	0.39	1,351	0.0	$169.56	$5,264.92	$0.00	31.05
Boiler room	Boiler	2	Heating Hot Water Pump	2.0	86.5%	No	1,200	No	86.5%	Yes	2	0.52	1,801	0.0	$226.08	$5,457.71	$0.00	24.14
Boiler room	Boiler	2	Heating Hot Water Pump	5.0	89.5%	No	1,200	No	89.5%	Yes	2	1.26	4,351	0.0	$546.26	$6,551.70	$0.00	11.99
Rooftop unit	HVV unit	1	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Fan coil units	Fan coil units	6	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Unit ventilators	Unit Ventilators	20	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Woodmont	Classrooms	2	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Woodmont	Classrooms	6	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Woodmont	Classrooms	3	Packaged AC	7.50		Yes	3	Packaged AC	7.50		16.00		Yes	9.85	19,510	0.0	$2,449.51	$42,347.38	$2,392.50	16.31
Woodmont	Classrooms	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		Yes	1.96	4,327	0.0	$543.27	$11,844.80	$710.00	20.50
Woodmont	Classrooms	2	Packaged AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Woodmont	Classrooms	1	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room LL1, Room LL2	Room LL1, Room LL2	2	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main office	Main office	1	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Principal's office	Principal's office	1	Window AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's office	Nurse's office	1	Window AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 4,5,7,9,11,13	CR 4,5,7,9,11,13	6	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	Gym	5	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tech closet	Tech closet	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	All school	2	Condensing Hot Water Boiler	1,720.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Kitchen and restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Art room	Sink	1	Tankless Water Heater	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room LL1, Nurse's office, Boys RR, CR3, Comp lab, Room 19, Lav - 27	10	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	15.5	$179.94	$71.70	$0.00	0.40

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Woodmont School	93	Computer	150.0	Yes
Woodmont School	22	Laptop	45.0	Yes
Woodmont School	13	Printer - Small	20.0	Yes
Woodmont School	6	Printer - Medium	60.0	Yes
Woodmont School	4	Printer - Big	600.0	Yes
Woodmont School	2	Paper Shredder	150.0	Yes
Woodmont School	23	Projector	200.0	Yes
Woodmont School	4	Microwave	1,000.0	No
Woodmont School	2	Refrigerator	156.0	No
Woodmont School	2	Coffee Machine	900.0	No
Woodmont School	1	Toaster oven	1,200.0	No
Woodmont School	12	Television - CRT	120.0	No
Woodmont School	1	Television LED	119.0	Yes
Woodmont School	2	Space Heater	1,500.0	No
Woodmont School	1	Water dispenser	500.0	No
Woodmont School	1	Kettle	1,000.0	No
Woodmont School	1	Standing fan	100.0	No
Woodmont School	23	Smart Board	5.0	Yes
Woodmont School	6	Chrome Book cart	40.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Faculty lounge	1	Refrigerated	Yes	0.00	1,612	0.0	$202.37	$230.00	$0.00	1.14

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Woodmont School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 43,062
Built: 1973

For Year Ending: January 31, 2016
Date Generated: September 14, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Woodmont School 39 Woodmont Road Pine Brook, New Jersey 07058	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5944707

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
65.4 kBtu/ft²

Source EUI
117.4 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,004,186 (36%)
Natural Gas (kBtu)	1,812,379 (64%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	70
National Median Source EUI (kBtu/ft²)	125.7
% Diff from National Median Source EUI	-7%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	208

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX 2 ECM CALCULATIONS

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Montville Township Public Schools
Exhibit D
ECM 1A LED Lighting
Lighting Upgrade and Heating Penalty

ECM DESCRIPTION

Retrofit existing lighting fixtures with new energy efficient lighting fixtures, install motion sensors and implement daylight harvesting in selected areas

DATA / ASSUMPTIONS

* Heating Season	20	Weeks
** Fraction of heat to be made-up	40.0%	
Heating Hours (Weather Data)	3,948	Hours

** Fraction of the Year Representing the Cooling Season Liberal estimate of the heating season, as there are times during the year when the building is neither heated nor cooled.
*** Fraction of the Lighting Reduction that Has to Be Made Up by Heating a portion of the lighting heat is released at night plus interior zones will have limited heating loads

MEASUREMENT AND VERIFICATION

Option A - The Engineering Calculations are based on 5% of the retrofitted lighting fixtures direct kW measurements and operating hours. The kW Measurements are taken for existing lighting fixtures before removal and for new installed lighting fixtures. Lighting operating hours are agreed by client basis from the audit, logging data, and operating personal input. The occupancy sensors savings are calculated as % of operating hours basebd on logging data and historical statistical data

COMMISSIONING

Confirm lighting operation and occupancy sensors functions

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Relatively high safety factor is used for this ECM because of direct measurements are proven over the time and savings are stipulated

CALCULATIONS

Detailed energy savings calculations are in the line-by-line calculation sheet

Admin

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Admin main office	9	84.48	760.32	0.7603	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	27	10.5	283.5	0.283499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.48
Admin workroom	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Payroll Clerk	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Diane Maggiore office	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Katie Slunt office	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Conference Room	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Closet Hallway1	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Men's Bathroom	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	0	10.5	0	0	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Woman's Bathroom	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Closet	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	21	21	0.020999	6" RETROFIT 8.5/14.5/21W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.01
Storage	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Superintendent Main	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Andrea Woodring	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Casey Shorter	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Superintendent	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Conference Room	7	84.48	591.36	0.5914	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	21	10.5	220.5	0.220499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
Special Services	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
Patricia Stryker	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Jennifer DeSaye	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Special Services	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Special Services Conference Room	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Kitchen	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Electrical Room	5	56.32	281.6	0.2816	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	10	10.5	105	0.104999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.18
Mail Room	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Facilities Manager	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Storage	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Server Room	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Main Hallway	13	56.32	732.16	0.7322	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	26	10.5	273	0.272999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.46
Entry	4	28	112	0.112	1 - 26 WATT CFL QUAD - PIN FIXTURE	4	21	84	0.083999	6" RETROFIT 8.5/14.5/21W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.03
Exterior Entry Canopy	1	58	58	0.058	2 - 26 WATT CFL QUAD - PIN FIXTURE	1	20	20	0.019999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.04
Entry	5	28	140	0.14	1 - 26 WATT CFL QUAD - PIN FIXTURE	5	0	0	0	**** ALREADY LED ****	0.14
Roof at Mechanical Equipment	1	75	75	0.075	PAR 38 FLOOD 75 WATT	1	17	17	0.016999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.06
Rear Doors	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	24	48	0.047999	WALLPACK 24W NEUTRAL LED 120V PC W/ GLASS LENS BZ	0.21
Entry Post Top - Silver	1	70	70	0.07	1-70 WATT MH	1	16.5	16.5	0.016499	16.5 WATT, A21, 4000K, 277 V, A LAMP	0.05
2 lamp harness kits	0	0	0	0	0 - N/A	40	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
3 lamp harness kits	0	0	0	0	0 - N/A	60	0	0	0	3 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
Non Shunted Sockets	0	0	0	0	0 - N/A	250	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
4" closet stock	0	0	0	0	0 - N/A	15	10.5	157.5	0.157499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-0.16
	110	**2414.36**	**7666.36**	**7.6663**		**622**	**424**	**2905**	**2.904966**		**4.76**

Cedar Hill

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Main Office	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Main Office Storage	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
Main Office - Principal	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Nurse's Office	0	0	0	0	0 - N/A	3	0	0	0	**** ALREADY LED ****	0
Nurse's Office - Bathroom	1	54	54	0.054	3-18 WATT CFL	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.04
Rest Room	4	60	240	0.24	A LAMP 60 WATT INCANDESCENT	4	8.5	34	0.033999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.21
Child Bathroom	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
CR 3	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 3 Bathroom	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
CR 4	14	56.32	788.48	0.7885	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	28	10.5	294	0.293999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.49
Girl's Room	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Boy's Room	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Copy Room - Entrance	2	52	104	0.104	2 - 26 WATT CFL FIXTURE	2	27	54	0.053999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.05
Copy Room Bathroom	0	0	0	0	0 - N/A	3	0	0	0	**** ALREADY LED ****	0
Copy Room	3	112.64	337.92	0.3379	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Media Center	0	0	0	0	0 - N/A	6	0	0	0	**** ALREADY LED ****	0
CR 5	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 7	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 8	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 9	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 10	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 11	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 12	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Custodian's Office	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Electrical Closet	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 13	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 14	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 15	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 16	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 17	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 18	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 19	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 20	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 22	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 23	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
CR 24	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
CR 2	16	56.32	901.12	0.9011	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.57
CR 2 - Bathroom	1	54	54	0.054	3-18 WATT CFL	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.04
CR 1	16	56.32	901.12	0.9011	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.57
CR 1 - Bathroom	1	54	54	0.054	3-18 WATT CFL	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.04
Boiler Room	8	26	208	0.208	1 - 26 WATT CFL SCREW-IN	8	8.5	68	0.067999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.14
Boiler Room	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.1
Boiler Room	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Hall - Farmers Ct	10	56.32	563.2	0.5632	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	20	10.5	210	0.209999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.35
Hall - Tolerance/Respect	31	56.32	1745.92	1.7459	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	62	10.5	651	0.650999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.09
Hall - Diversity	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Hall - Diversity	8	56.32	450.56	0.4506	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Hall - Caring/Compassion	24	56.32	1351.68	1.3517	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Hall - Caring/Compassion Fulhan	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
Hall - Caring/Compassion	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Hall - Caring/Compassion Displa	3	58	174	0.174	2 - 26 WATT CFL QUAD - PIN FIXTURE	3	21	63	0.062999	6" RETROFIT 8.5/14.5/21W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.11
RM 132 - Multi Purpose/Cafe	2	29.92	59.84	0.0598	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	4	8	32	0.031999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.03
RM 132 Multipurpose/Cafe	30	84.48	2534.4	2.5344	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	90	10.5	945	0.944999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.59
RM 132 Multipurpose/Cafe Clos	6	56.32	337.92	0.3379	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
BR 1	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
BR 1 Fulham EM	0	0	0	0	0 - N/A	0	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
BR 2	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
BR 2 Fulham EM	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
Custodial	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
RM 131 Music	11	112.64	1239.04	1.239	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
RM 131 Music Fulham EM	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
RM 131 Music	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
RM 131 Music Closet	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
RM 133 Break Room	5	84.48	422.4	0.4224	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	15	10.5	157.5	0.157499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.26
RM 133 Break Room	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
RM 134 Music	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 135	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 135 BR	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 136	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 136 BR	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 137	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64

Company Internal

Cedar Hill

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
CR 137 BR	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 138	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 138 Closet	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 138 Water Heater	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Lower Hall	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Exterior 150W WP	7	190	1330	1.33	METAL HALIDE, 1-150 WATT LAMP	7	24	168	0.167999	WALLPACK 24W NEUTRAL LED 120V PC W/ GLASS LENS BZ	1.16
Exterior Canopy	5	60	300	0.3	A LAMP 60 WATT INCANDESCENT	5	0	0	0	**** ALREADY LED ****	0.3
Exterior 175W WP	3	201	603	0.603	175 WATT MH WALL PACK	3	30	90	0.089999	WALLPACK 30W NEUTRAL LED 277V PCS W/ POLYCARB LENS BZ - DLC LISTED	0.51
Non Shunted Sockets	0	0	0	0	0 - N/A	1200	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
1L Harness Kits	0	0	0	0	0 - N/A	30	0	0	0	1 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
2L Harness Kits	0	0	0	0	0 - N/A	390	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
3L Harness Kits	0	0	0	0	0 - N/A	80	0	0	0	3 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4L Harness Kits	0	0	0	0	0 - N/A	25	0	0	0	4 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4' Tube Closet Stock	0	0	0	0	0 - N/A	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-0.31
FL030 Sockets for Bi LevelSwitch	0	0	0	0	0 - N/A	40	0	0	0	U TUBE SOCKET NON SHUNTED	0
Exterior - 70W Wallpack	1	70	70	0.07	1-70 WATT MH	1	24	24	0.023999	WALLPACK 24W NEUTRAL LED 120V PC W/ GLASS LENS BZ	0.05
	530	**4482.2**	**35044.12**	**35.0441**		**2989**	**789.5**	**12731**	**12.73093**		**22.31**

Company Internal

High School

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
1ST FL MAIN OFFICE	12	60	720	0.72	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	36	8	288	0.287999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.43
1ST FL MAIN OFFICE HALL	10	52	520	0.52	2 - 26 WATT CFL FIXTURE	10	27	270	0.269999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.25
MAIN OFFICE RM 216 COPY RM	7	60	420	0.42	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	21	8	168	0.167999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.25
MAIN OFFICE UTUBE KITS	0	0	0	0	0 - N/A	72	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
MAIN OFFICE HALL	2	60	120	0.12	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.07
MAIN OFFICE SANDRA SCHULTZ OFFICE	3	60	180	0.18	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	9	8	72	0.071999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.11
MAIN OFFICE DAVID TUBBS OFFICE	3	60	180	0.18	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	9	8	72	0.071999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.11
MAIN OFFICE SCOTT MCGOVERN OFFICE	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
MAIN OFFICE HALL CLOSET SAFE	1	52	52	0.052	2 - 26 WATT CFL FIXTURE	1	27	27	0.026999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.03
MAIN OFFICE PRINCIPAL OFFICE	6	60	360	0.36	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	18	8	144	0.143999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.22
MAIN OFFICE ED FLEIUCHMAN OFFICE	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
MAIN OFFICE 217 ELECTRIC CLOSET	3	60	180	0.18	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	9	8	72	0.071999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.11
MAIN OFFICE NURSE OFFICE	8	60	480	0.48	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	24	8	192	0.191999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.29
MAIN OFFICE NURSE OFFICE BR SINK	4	29.92	119.68	0.1197	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	8	8	64	0.063999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.06
MAIN OFFICE NURSE OFFICE BR SINK	1	52	52	0.052	2 - 26 WATT CFL FIXTURE	1	27	27	0.026999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.03
MAIN OFFICE NURSE PATIENT AREA	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
MAIN OFFICE JESSICA WARE OFFICE	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
MAIN OFFICE RECEPTION AREA BACK	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
MAIN OFFICE RM 213	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
MAIN OFFICE RM 214 ASSIST PRINCIPAL	4	60	240	0.24	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.14
1ST FL MAIN HALLWAY	63	60	3780	3.78	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	189	8	1512	1.511999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	2.27
MAIN HALL UTUBE KITS	0	0	0	0	0 - N/A	72	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
MAIN HALL	48	52	2496	2.496	2 - 26 WATT CFL FIXTURE	48	27	1296	1.295999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	1.2
MAIN HALL INSIDE	33	52	1716	1.716	2 - 26 WATT CFL FIXTURE	33	27	891	0.890999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.83
1ST FL MAIN HALL	15	28.16	422.4	0.4224	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	15	10.5	157.5	0.157499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.26
1ST FL MAIN HALL DISPLAY CASE	4	28.16	112.64	0.1126	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
1ST FL MAIN HALL DISPLAY CASES	0	8	0	0	1-F8/T5 (12")	20	0	0	0	2FT 1 LAMP STRIP	0
1ST FL MAIN HALL DISPLAY CASES	20	8	160	0.16	1-F8/T5 (12")	20	8	160	0.159999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0
1ST FL STORAGE ACROSS FROM SUPERVISOR OFFICE	5	28.16	140.8	0.1408	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	5	10.5	52.5	0.052499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.09
1ST FL STORAGE ACROSS FROM SUPERVISORS OFFICE	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
1ST FL MAIN LOBBY HALL BR'S ALREADY LED	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
1ST FL MAIN LOBBY DETENTION RM	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
1ST FL RM 100 PRE HEALTH	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
RM 100 Fulham em	0	0	0	0	0 - N/A	4	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
RM 102 WEIGHT RM	40	84.48	3379.2	3.3792	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	120	10.5	1260	1.259999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	2.12
1st FL MENS RM	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
RM 104	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
MAIN GYM 046 OFFICE	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
MAIN GYM 046 OFFICE BR	2	29.92	59.84	0.0598	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	4	8	32	0.031999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.03
MAIN GYM RM 051 GIRLS LOCKER RM	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
MAIN GYM MENS BR	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
WOMENS BR	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
RM 101/102	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
BANDSTORAGE LEFT OF MENS BR	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 103	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Cr103 Fulham em	0	0	0	0	0 - N/A	3	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
CR 106	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
CR 105 WOODSHOP	30	56.32	1689.6	1.6896	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
CR 105 office	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	12	12	0.011999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
CR 105 ELECTRIC CLOSET	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 108	11	112.64	1239.04	1.239	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
CR 108 STORAGE	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 108 kitchen	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 107	21	112.64	2365.44	2.3654	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	84	10.5	882	0.881999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.48
CR 107 G STORAGE	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
RM 110 TECH HUB	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
RM 111 CAD DESIGN	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
RM 112 APPLIED TECH	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
RM 112 APPLIED TECH BACK RM	14	112.64	1576.96	1.577	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	56	10.5	588	0.587999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
RM 112 office Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
RM 113 TECH RM	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
RM 109 BAND RM	33	56.32	1858.56	1.8586	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	66	10.5	693	0.692999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.17
RM 109 STORAGE	3	112.64	337.92	0.3379	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
RM 109 Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
RM 109 STORAGE 2	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
RM 109 STORAGE 3	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
RM 109 STORAGE 4	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
RM 109 BACK DOOR BY EXIT	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
RM 109 Exit	2	46	92	0.092	2 - 23 WATT BI PIN FLUORESCENT FIXTURE WITH ELECTRONIC BALLAST	2	0.75	1.5	0.001499	COOPER SURELITE LED EXIT/EMERGENCY COMBO (RED LETTERS)	0.09
BR ACROSS FROM CAFE	3	75	225	0.225	PAR 38 FLOOD 75 WATT	3	8	24	0.023999	LED BR30 8 WATT CLOUD DESIGN, E26 BASE, 120V, 4000K, DIMMABLE (ENERGY STAR)	0.2
BR Sink	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
100 WING HALLWAY-CR 103 TO AUX GYM	19	56.32	1070.08	1.0701	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	38	10.5	399	0.398999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.67
100 wing exit sign	3	46	138	0.138	2 - 23 WATT BI PIN FLUORESCENT FIXTURE WITH ELECTRONIC BALLAST	3	0	0	0	COOPER SURELITE LED EMERGENCY LIGHT WITH BATTERY BACKUP	0.14
100 WING HALLWAY-CR105 TO CR 108	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
100 WING HALL-RM 112 TO CAFE ENTRY	19	56.32	1070.08	1.0701	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	38	10.5	399	0.398999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.67
100 Wing Fulham em	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
100 WING HALL-RM112 TO CAFE ENTRY	2	58	116	0.116	2 - 26 WATT CFL QUAD - PIN FIXTURE	2	27	54	0.053999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.06

Company Internal

High School

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
100 WING HALL-RM AUX GYM/MAIN GYM	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
100 WING HALL-TO AUX/MAIN GYM	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
100 Wing hall to aux/main gym Fulham em	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
HALL TO AUX/MAIN GYM	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Hall to main gym Fulham em	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
AUX GYM	20	226	4520	4.52	4' FIXTURE, 4-F54/T5/HO/LAMPS, ELECTRONIC BALLAST	20	167	3340	3.339999	2 X 2, HIGH BAY, ECO LINEAR, 167W, 4000K, 120-277VAC, DIMMABLE, MEDIUM OPTIC - DLC LIST	1.18
Aux Gym wire Guards for Ecolinear	0	0	0	0	0 - N/A	20	0	0	0	WIRE GUARD, 2 PIECES FOR 2'X 2' (DOUBLE SHORT)	0
AUX GYM COACHES OFFICE	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Aux Gym wrestling Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
AUX GYM WRESTLING ENTRY	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
STORAGE BY WRESTLING GYM	5	56.32	281.6	0.2816	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	10	10.5	105	0.104999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.18
Mr Gallagher office	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
STORAGE 1	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
STORAGE 2	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
STORAGE 2 BACK HALL	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
STORAGE 2 Fulham em	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
SCHOOL STORE	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
HALLWAY AT BOILER RM	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Boiler hall Exit	1	46	46	0.046	2 - 23 WATT BI PIN FLUORESCENT FIXTURE WITH ELECTRONIC BALLAST	1	0	0	0	COOPER SURELITE LED EMERGENCY LIGHT WITH BATTERY BACKUP	0.05
CUSTODIAL SUPERVISOR OFFICE	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
KATHYS OFFICE	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
BOILER RM GENERATOR	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
BOILER RM GENERATOR BACK RM	5	56.32	281.6	0.2816	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	10	10.5	105	0.104999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.18
CAFETERIA	40	84.48	3379.2	3.3792	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	120	10.5	1260	1.259999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	2.12
CAFETERIA Fulham EM	0	0	0	0	0 - N/A	14	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
CAFETERIA NEW AREA	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CAFETERIA NEW AREA	24	84.48	2027.52	2.0275	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	72	10.5	756	0.755999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.27
KITCHEN	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
Kitchen Fulham em	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
KITCHEN OFFICE	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Kitchen Fulham em	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
KITCHEN FREEZER	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	12	24	0.023999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.1
COOKING SERVERY	17	56.32	957.44	0.9574	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	34	10.5	357	0.356999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.6
COOKING SERVERY STORAGE	12	28.16	337.92	0.3379	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
COOKING SERVERY DISHWASHING AREA	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
COOKING SERVERY UNDER RANGE HOOD	2	29.92	59.84	0.0598	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	4	8	32	0.031999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.03
COOKING SERVERY UNDER RANGE HOOD	2	29.92	59.84	0.0598	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	4	8	32	0.031999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.03
FACULTY DINING	4	256	1024	1.024	4' FIXTURE, 8-F32/T8 LAMPS, ELECTRONIC BALLAST-TOTAL WATTS=256 WATT	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
ELECTRIC CLOSET @HALL TO AUX GYM	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
FACULTY RM 344	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
HALLWAY TO CR314 GUIDANCE COUNSELERS	22	56.32	1239.04	1.239	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
Hall entry to media. Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
HALLWAY CR 313 TO 310	16	56.32	901.12	0.9011	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.57
HALLWAY CR 309 TO 301	18	56.32	1013.76	1.0138	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
HALLWAY MENS RM TO MEDIA CENTER	13	56.32	732.16	0.7322	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	26	10.5	273	0.272999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.46
STAIRWELL F	6	89.76	538.56	0.5386	*2' FIXTURE, 6-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	36	8	288	0.287999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.25
STAIRWELL E	6	89.76	538.56	0.5386	*2' FIXTURE, 6-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	36	8	288	0.287999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.25
STAIRWELL B	6	89.76	538.56	0.5386	*2' FIXTURE, 6-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	36	8	288	0.287999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.25
STAIRWELL A Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
GYM RM 031 TRAINER	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Rm031 Fulham em	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
GYM 028 HALL	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Gym 028 hall Already led	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
GYM HALL BY EXIT 6	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Gym hall by exit 6 Fulham em	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
GYM Y'ALL BY EXIT 6	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
ATHLETIC AD OFFICE	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
BOYS TEAM ROOM	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Gym 021 Already led	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
LOCKER RM 020	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Boys 016 Already led	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
RM 017A	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
BR 018	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Shower Already led	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
MEDIA CENTER	18	28	504	0.504	4' FIXTURE 1-FP-28/T5/ELECTRONIC BALLAST	18	14	252	0.251999	UNI-FIT T5 HE 4' BALLAST READY LED TUBE 14 WATT FROSTED 4000K - DLC LISTED	0.25
Media Center T5 ballasts	0	0	0	0	0 - N/A	18	0	0	0	PHILIPS ADVANCE T5 HE 2 LAMP BALLAST MARK 10 POWERLINE	0
Media center Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
AUDITORIUM MAIN LIGHTS	100	300	30000	30	300 WATT, BR 40 LAMP	100	17	1700	1.699999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	28.3
AUDITORIUM STEP LIGHTS	24	40	960	0.96	A LAMP 40 WATT INCANDESCENT	24	6.5	156	0.155999	LED A19 6.5 WATT, FULLY OMNI, E26 BASE, 120V, 3000K, DIMMABLE (ENERGY STAR)	0.8
AUDITORIUMS RACK LIGHTS	51	150	7650	7.65	PAR 38 FLOOD 150 WATT	51	14	714	0.713999	UNI-FIT T5 HE 4' BALLAST READY LED TUBE 14 WATT FROSTED 4000K - DLC LISTED	6.94
STAGE	18	56.32	1013.76	1.0138	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
AUDITORIUM STAIRS	4	75	300	0.3	PAR 38 FLOOD 75 WATT	4	17	68	0.067999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.23
PROJECTOR RM	18	75	1350	1.35	PAR 38 FLOOD 75 WATT	18	17	306	0.305999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	1.04
CUSTODIAL CLOSET	3	28.16	84.48	0.0845	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
UPPER CATWALK FROM CUSTODIAN RM	12	50	600	0.6	4' FIXTURE, 1-F40/T12 LAMP, ENERGY SAVING MAGNETIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.47
HALLWAY TO PROJECTOR RM	4	54	216	0.216	3-18 WATT CFL	4	10	40	0.039999	VANDALPROOF CANOPY 10W NEUTRAL LED 120-277 WITH DROP LENS	0.18
GUIDANCE OFFICES	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42

High School

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Guidance Offices Fulham em	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
Guidance 316C	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 316D	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 316A	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 317B	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 317F	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 317C	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 317E	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 334A	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 334B	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Guidance 334C	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 319	8	112.64	901.12	0.9011	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.57
CR 318	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Office 315D	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Office 315A	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Office 315B	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Office 315C	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Office 315E	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CUSTODIAL CLOSET	1	28.16	28.16	0.0282	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.02
CR 314	16	56.32	901.12	0.9011	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.57
CR 313	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Office RM 341 &341A Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
CR 312	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 311	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 310	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 309	13	56.32	732.16	0.7322	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	26	10.5	273	0.272999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.46
CR 309 Storage	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 307	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 308	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR305	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 306	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 303	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 304	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 302	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 330	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 301	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Men's /women's BRs Already led	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
Electrical RM 342	1	28.16	28.16	0.0282	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.02
Electrical RM 342	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
TECH OFFICE	10	56.32	563.2	0.5632	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	20	10.5	210	0.209999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.35
Courtyard	5	190	950	0.95	METAL HALIDE, 1-150 WATT LAMP	5	50	250	0.249999	ALED50 TYPE IV 8 POLE ARM NEUTRAL LED + 277V PC BRONZE - DLC LISTED	0.7
CR 500	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 501	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 502	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 503	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 504	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 505	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 518	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
ELECTRIC CLOSET	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
517B ELECTRIC MECH CLOSET	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
ELEVATOR	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
CUST CL	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
MENS BR	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
MENS BR FULHAM EM	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
MENS BR	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 506	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
CR 506C	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
CR 506 BR	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
WOMENS BR	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
WOMENS BR FULHAM EM	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
GARAGE	29	56.32	1633.28	1.6333	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	58	10.5	609	0.608999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.02
CR 507	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
CR 508	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
CR 508B	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 514	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
CR 513	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Maintenance RM next to 507B	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
MAINTENANCE RM NEXT TO 507B	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 509	20	84.48	1689.6	1.6896	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
CR 509 DARK RM	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 509 DARK RM RECESSED	5	60	300	0.3	A LAMP 60 WATT INCANDESCENT	5	9	45	0.044999	LED A19 9 WATT, FULLY OMNI, E26 BASE, 120V, 2700K, DIMMABLE (ENERGY STAR)	0.26
CR 509E	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	9	9	0.008999	LED A19 9 WATT, FULLY OMNI, E26 BASE, 120V, 2700K, DIMMABLE (ENERGY STAR)	0.05
CR 509D	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	9	9	0.008999	LED A19 9 WATT, FULLY OMNI, E26 BASE, 120V, 2700K, DIMMABLE (ENERGY STAR)	0.05
CR 509D STORAGE	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
HALL TO STORAGE	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 511	26	84.48	2196.48	2.1965	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	78	10.5	819	0.818999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.38
CR 511D	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07

Company Internal

High School

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
CR 511B	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 511B KILN RM	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
BOILER RM	12	28.16	337.92	0.3379	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
2ND FL CR 419	14	84.48	1182.72	1.1827	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
CR 442	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
CR 420	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
CR 421	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 422	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 401	18	84.48	1520.64	1.5206	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	54	10.5	567	0.566999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.95
CR 402	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
CR 402A PREP	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
RESOURCE 433	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
CR 403	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
CR 404	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 405	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
CR 405A PREP`	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
CR 406	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 407	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
CR 408	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 409	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 410	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 411	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
RM 430 WORLD LANGUAGE	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
CR 412	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
CR 413	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
JAN CLOSET	1	28.16	28.16	0.0282	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.02
CR 414A	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
CR 415	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
CR 414	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
RESOURCE EC19	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
CR 418	20	84.48	1689.6	1.6896	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
CR 416	20	84.48	1689.6	1.6896	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
CR 417	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
CR 417	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
CR 414C	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
2ND FL 400 WING HALL	59	84.48	4984.32	4.9843	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	177	10.5	1858.5	1.858499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	3.13
2ND FL 400 WING EM FULHAM	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
2ND FL DISPLAY CASE	2	14.96	29.92	0.0299	*2' FIXTURE, 1-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
DISPLAY CASE AT CR 401	2	25	50	0.05	2' FIXTURE, 1-F20/T12/STD LAMP, ENERGY SAVING MAGNETIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.03
2ND FL 600 WING HALL	34	84.48	2872.32	2.8723	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	102	10.5	1071	1.070999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.8
2ND FL 600 WING EM FULHAM	0	0	0	0	0 - N/A	10	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
CR 603	24	84.48	2027.52	2.0275	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	72	10.5	756	0.755999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.27
ENTRIES FOR CR 603 & CR 602	2	28	56	0.056	1 - 26 WATT CFL QUAD - PIN FIXTURE	2	14	28	0.027999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.03
CR 602	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 602 PREP	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
CR 600 CHEM LAB	24	84.48	2027.52	2.0275	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	72	10.5	756	0.755999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.27
CR 600 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
RM 619 IT LOCKED	7	84.48	591.36	0.5914	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	21	10.5	220.5	0.220499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
CR 618	7	84.48	591.36	0.5914	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	21	10.5	220.5	0.220499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
CR 604	20	84.48	1689.6	1.6896	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
CR 604 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
ELECTRIC PANEL CLOSET 17	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
CR 607	20	84.48	1689.6	1.6896	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
CR 607 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
617B CLOSET	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
2ND FL HALL STAIRCASE	8	58	464	0.464	2 - 26 WATT CFL QUAD - PIN FIXTURE	8	40	320	0.319999	9.5" RETROFIT, 30 WATT, W/ EM 10 W DRIVER, 120-277V, 4000K	0.14
600 WING WOMENS BR	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
600 WING WOMENS BR EM FULHAM	0	0	0	0	0 - N/A	1	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
CR 608	19	84.48	1605.12	1.6051	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	57	10.5	598.5	0.598499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.01
CR 608 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
609 B ELECTRIC PANEL LOCKED	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
FACULTY BR @ 608	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
RM 615 RESOURCE	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
CR 610	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 610 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
PREP RM 605 AT CR 607	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
PREP RM CR 610/609A	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
MEN BR	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
D STAIRWELL	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
D STAIRWELL	2	58	116	0.116	2 - 26 WATT CFL QUAD - PIN FIXTURE	2	45	90	0.089999	9.5" RETROFIT 23.5/32/45W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.03
CR 612 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
CR 612	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
CR 612 PREP	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
CR 614	24	84.48	2027.52	2.0275	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	72	10.5	756	0.755999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.27
CR 614 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01
CR 611	24	84.48	2027.52	2.0275	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	72	10.5	756	0.755999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.27
CR 611 ENTRY	1	28	28	0.028	1 - 26 WATT CFL QUAD - PIN FIXTURE	1	14	14	0.013999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.01

Company Internal

High School

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
C STAIRWELL	2	58	116	0.116	2 - 26 WATT CFL QUAD - PIN FIXTURE	2	45	90	0.089999	9.5" RETROFIT 23.5/32/45W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.03
C STAIRWELL AT EX 39	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
1ST FL HALLWAY	38	84.48	3210.24	3.2102	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	114	10.5	1197	1.196999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	2.01
1ST FL HALL FULHAM EM	0	0	0	0	0 - N/A	0	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
1ST FL HALL CLASSROOM ENTRIES	12	28	336	0.336	1 - 26 WATT CFL QUAD - PIN FIXTURE	12	14	168	0.167999	4" RETROFIT 6/9/14W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.17
EXTERIOR FRONT	6	75	450	0.45	PAR 38 FLOOD 75 WATT	6	17	102	0.101999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.35
EXTERIOR LEFT BY DOOR	1	58	58	0.058	2 - 26 WATT CFL QUAD - PIN FIXTURE	2	9.5	19	0.018999	PL H G24Q/G24D 9.5W PL EDGE SERIES BYPASS 120-277V HORIZONTAL	0.04
EXTERIOR POLE LIGHTS	3	128	384	0.384	METAL HALIDE, 1-100 WATT LAMP	3	27	81	0.080999	HID LED E26 27W, 4000K, 120-277V NON-DIMMABLE	0.3
EXTERIOR PATHWAY TO FIELD	8	128	1024	1.024	METAL HALIDE, 1-100 WATT LAMP	8	27	216	0.215999	HID LED E26 27W, 4000K, 120-277V NON-DIMMABLE	0.81
EXTERIOR LEFT SIDE BY FIELD	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W NEUTRAL LED 277V PCS W/ POLYCARB LENS BZ - DLC LISTED	0.2
EXTERIOR BY DOOR 43	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
EXTERIOR BY GARAGE	4	128	512	0.512	METAL HALIDE, 1-100 WATT LAMP	4	45	180	0.179999	9.5" RETROFIT 23.5/32/45W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.33
EXTERIOR BY GARAGE	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.2
EXTERIOR BACK OF SCHOOL BY DOOR 39	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W NEUTRAL LED 120-277V WHITE	0.2
EXTERIOR GREEN POLE LIGHTS	11	128	1408	1.408	METAL HALIDE, 1-100 WATT LAMP	11	27	297	0.296999	HID LED E26 27W, 4000K, 120-277V NON-DIMMABLE	1.11
EXTERIOR CANOPY LIGHTS BY DOORS 36/37	3	128	384	0.384	METAL HALIDE, 1-100 WATT LAMP	3	20	60	0.059999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.32
EXTERIOR BY DOOR 32	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W NEUTRAL LED 120-277V WHITE	0.2
EXTERIOR BY RM 509 DOOR	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
EXTERIOR BACK OF SCHOOL RM 611	4	128	512	0.512	METAL HALIDE, 1-100 WATT LAMP	4	45	180	0.179999	9.5" RETROFIT 23.5/32/45W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE	0.33
EXTERIOR BY DR 29/30	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.2
EXTERIOR BACK OF SCHOOL BY DOOR 28	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.2
EXTERIOR BY DOOR STAIRWELL E ALREADY LED	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
EXTERIOR BY DOOR 24 RECESSED	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	25	25	0.024999	HID LED E26 25W HIGH OUTPUT 277V NON-DIMMABLE, 4000K, MED BASE	0.1
EXTERIOR BY DOOR 24 WALLPACK	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
EXTERIOR BY DOOR 22/21 CANOPY	4	128	512	0.512	METAL HALIDE, 1-100 WATT LAMP	4	25	100	0.1	HID LED E26 25W HIGH OUTPUT 277V NON-DIMMABLE, 4000K, MED BASE	0.41
EXTERIOR BY DOOR 20 WALLPACK	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
EXTERIOR BY CR 111 WALLPACK	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
EXTERIOR BY DR 17 CAN	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	27	27	0.026999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.1
EXTERIOR BY DOOR 15 ALREADY LED	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
EXTERIOR LEFT BY DOOR 14	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	27	27	0.026999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.1
EXTERIOR BY DOOR 14 WALLPACK	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
EXTERIOR RIGHT SIDE OF SCHOOL BY DOORS 11/12 ALREAI	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
EXTERIOR RIGHT SIDE BY DOORS 9/10	3	128	384	0.384	METAL HALIDE, 1-100 WATT LAMP	3	27	81	0.080999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.3
EXTERIOR DOOR 7 ALREADY LED	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
EXTERIOR CANOPY DOOR 6	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	20	20	0.019999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.11
EXTERIOR FRONT RIGH SIDE WALLPACK ALREADY LED DR 5	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
EXTERIOR LEFT OF DOORS BY DR 5 ALREADY LED	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
EXTERIOR FRONT RIGHT	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
Closet Stock	0	0	0	0	0 - N/A	28	8	224	0.223999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	-0.22
Closet Stock	0	0	0	0	0 - N/A	250	10.5	2625	2.624999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-2.62
FL030 Sockets	0	0	0	0	0 - N/A	550	0	0	0	U TUBE SOCKET NON SHUNTED	0
FL200N - Non Shunted Sockets	0	0	0	0	0 - N/A	5225	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
1 Lamp Socket Kits	0	0	0	0	0 - N/A	325	0	0	0	1 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
2 Lamp Socket Kits	0	0	0	0	0 - N/A	875	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
3 Lamp Socket Kits	0	0	0	0	0 - N/A	1000	0	0	0	3 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4 Lamp Socket Kits	0	0	0	0	0 - N/A	55	0	0	0	4 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
6 Lamp Socket Kits	0	0	0	0	0 - N/A	20	0	0	0	6 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
	2567	**22687.4**	**218194.2**	**218.1939**		**14768**	**4031.75**	**73788**	**73.787696**		**144.41**

Company Internal

Hilldale

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Main Office	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Main Office	4	75	300	0.3	PAR 38 FLOOD 75 WATT	4	12	48	0.047999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.25
Principal	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Main Office Hallway	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Main Office Hallway	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Main Office Bathroom	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.1
Main Office Bathroom	2	13	26	0.026	1 - 13W CFL	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.01
Main Office Kitchen	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 1	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 1	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 1 4' Wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 1 8' Wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Nurse's Office	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Nurse's Office Bathroom	2	23	46	0.046	1 - 23 WATT CFL	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.03
CR 2	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 2	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 2 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 2 8' wrap	0	257	0	0	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 3	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 3	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 3 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 3 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 4	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 4 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 4	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 4 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Boy's Bathroom	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
BS 1 CR 1	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
BS 1 CR 2	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
CR 5	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 5 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 5	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 5 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 6	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 6 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 6	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 6 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 7 Art	6	257	1542	1.542	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.29
CR 7 Art	0	0	0	0	0 - N/A	6	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 7 Art	3	145	435	0.435	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
CR 7 Art 4' wrap	0	0	0	0	0 - N/A	3	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 7 Art	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 7 Art Storage	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
CR 8 Music	6	257	1542	1.542	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.29
CR 8 Music 8' wrap	0	0	0	0	0 - N/A	6	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 8 Music	3	145	435	0.435	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
CR 8 Music 4 wrap	0	0	0	0	0 - N/A	3	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 8 Music	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 8 Music Storage	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
CR 9	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 9 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 9	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 9 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 10	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 10 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 10	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 10 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 11	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 11 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 11	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 11 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Handicapped Bathroom	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 12	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 12 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 12	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 12 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Girls' Bathroom	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Custodial Closet	0	56.32	0	0	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	0	10.5	0	0	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0
CR 13	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 13 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 13	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 13 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0

Company Internal

Hilldale

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
CR 14	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
CR 14 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
CR 14	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
CR 14 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Faculty Room	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Stemroom near Medical	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Stemroom near Medical Storage	1	28.16	28.16	0.0282	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.02
Stemroom near Medical Storage	1	78	78	0.078	8' FIXTURE, 1-F96/T12/60 WATT, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.06
Stemroom near Medical Storage	0	0	0	0	0 - N/A	1	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Bathroom near CR 2	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Media Center	8	145	1160	1.16	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.99
Media Center 4' wrap	0	0	0	0	0 - N/A	8	0	0	0	4FT WRAP AROUND 2 LAMP	0
Media Center	8	257	2056	2.056	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.72
Media Center 8' wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Media Center Server Room	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Hall at Gym	6	56.32	337.92	0.3379	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Hall at Gym Fulham EM	0	0	0	0	0 - N/A	2	0	0	0	FULHAM HOTSPOT LINEAR KIT: BATTERY/DRIVER/LINEAR ARRAY	0
K-1 Hall	22	56.32	1239.04	1.239	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
K-1 Hall	15	29.92	448.8	0.4488	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	30	8	240	0.239999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.21
Grade 4-5 Hall	22	257	5654	5.654	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	50	40	2000	2	KEYSTONE CONSTANT CURRENT 40W LED DRIVER	3.65
Grade 4-5 Hall	22	257	5654	5.654	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	132	27.9	3682.8	3.682799	KEYSTONE 1600SL SERIES 2' LED BOARD - 27.9WATTS - 4000K	1.97
Grade 4-5 Hall	14	60	840	0.84	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	42	8	336	0.335999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.5
Grade 4-5 Hall	1	100	100	0.1	A LAMP 100 WATT INCANDESCENT	1	16.5	16.5	0.016499	16.5 WATT, A21, 4000K, 277 V, A LAMP	0.08
Cust Room Copy	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
CR 20	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
CR 20	1	96	96	0.096	*2' FIXTURE, 3-F32/T8/U3 LAMPS, ELECTRONIC BALLAST	1	20	20	0.019999	INTERIOR LUMINAIRES, G2 THIN PANEL, 2X2, 20W, 4000K, 120-277VAC, DIMMABLE - DLC LIS	0.08
CR 20 Bathroom	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
BR 1	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
BR 2	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
Girls Bathroom by Exit 6	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Girls Bathroom by Exit 6	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
Boys Bathroom by Exit 6	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Boys Bathroom by Exit 6	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 19	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
CR 19	1	96	96	0.096	*2' FIXTURE, 3-F32/T8/U3 LAMPS, ELECTRONIC BALLAST	1	20	20	0.019999	INTERIOR LUMINAIRES, G2 THIN PANEL, 2X2, 20W, 4000K, 120-277VAC, DIMMABLE - DLC LIS	0.08
CR 19 Bathroom	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 18	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
CR 18	1	96	96	0.096	*2' FIXTURE, 3-F32/T8/U3 LAMPS, ELECTRONIC BALLAST	1	20	20	0.019999	INTERIOR LUMINAIRES, G2 THIN PANEL, 2X2, 20W, 4000K, 120-277VAC, DIMMABLE - DLC LIS	0.08
CR 18 Bathroom	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
CR 24 Music	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 23 ESL	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 22	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 21	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 17	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 16	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 15	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Boiler Room	7	32	224	0.224	1 - 32 WATT CFL	7	8.5	59.5	0.059499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.16
Gym	16	112.64	1802.24	1.8022	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	64	18	1152	1.151999	G4 HO 4 FOOT 18W 4000K FROSTED LENS SEP LED TUBE - DLC LISTED	0.65
Gym Fridge Area	1	25	25	0.025	*3' FIXTURE, 1-F25/T8/ LAMPS, ELECTRONIC BALLAST	1	12	12	0.011999	G4 SP 3 FOOT 12W 4000K 120LPW NANO LENS SEP LED TUBE	0.01
Gym Storage	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
Gym Storage Upper	3	257	771	0.771	8' FIXTURE, 2-F96/T12/HO 110 WATT LAMPS, STANDARD MAGNETIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.65
Gym Storage Lower	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Gym Storage Lower	1	145	145	0.145	4' FIXTURE, 2-F48/T12 HO LAMPS, STANDARD MAGNETIC BALLAST - HO END CAP	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.12
Exterior Building Perimeter	4	172	688	0.688	150 WATT MH WALL PACK	4	37	148	0.147999	WALLPACK 37W NUETRAL LED BRONZE - DLC LISTED	0.54
Grade 4-5 Hall	0	0	0	0	0 - N/A	14	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Gym Storage Upper 8' Wrap	0	0	0	0	0 - N/A	3	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
CR 2 8' Wrap	0	0	0	0	0 - N/A	8	0	0	0	WRAP FIXTURE 8' TANDEM WIRED FOR LED	0
Building Perimeter	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
Exterior - Parking Lot Pole Lights	0	0	0	0	0 - N/A	4	0	0	0	**** ALREADY LED ****	0
Exterior - Building Perimeter Wa	0	0	0	0	0 - N/A	3	0	0	0	**** ALREADY LED ****	0
Non Shunted Sockets	0	0	0	0	0 - N/A	1352	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
1 Lamp Socket Kit	0	0	0	0	0 - N/A	5	0	0	0	1 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
2 Lamp Socket Kit	0	0	0	0	0 - N/A	75	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4 Lamp Socket Kit	0	0	0	0	0 - N/A	20	0	0	0	4 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4' 10.5W 4000 Closet Stock	0	0	0	0	0 - N/A	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-0.63
	541	**11073.64**	**77573.16**	**77.5731**		**3339**	**1075.4**	**21206.3**	**21.206209**		**56.37**

Company Internal

Lazar

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Main office	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Copy Rm	3	112.64	337.92	0.3379	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Principal Office	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Restroom by Exit 7	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Hallway by Gym	8	56.32	450.56	0.4506	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Mazur Office	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Mazur Office	2	13	26	0.026	1 - 13W CFL	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 3000K, DIMMABLE - ENERGY STAR	0.01
Boys Bath Rm	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Guidance Dept - Main Area	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Guidance - Copy Rm	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Guidance Copy Rm	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Mrs. Meenan Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Mrs. Rappart Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Mrs. Gonzalez Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Storage	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Storage	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Custodial Closet	1	42	42	0.042	1-42 WATT CFL	1	12	12	0.011999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.03
Boiler Rm	0	0	0	0	0 - N/A	7	0	0	0	**** ALREADY LED ****	0
Girl's Bath Rm	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
SAC Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
SAC Office	3	60	180	0.18	A LAMP 60 WATT INCANDESCENT	3	8.5	25.5	0.025499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 3000K, DIMMABLE - ENERGY STAR	0.15
SAC Office - Bath Rm	1	75	75	0.075	PAR 38 FLOOD 75 WATT	1	8	8	0.007999	LED BR30 8 WATT CLOUD DESIGN, E26 BASE, 120V, 3000K, DIMMABLE (ENERGY STAR)	0.07
Class Rm 1	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 2	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 3	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 4	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 5	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 6	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Rm 7 - Nurse's Office	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Rm 7 - Nurse's Office	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Rm 7 - Nurse's Office Bath Rm	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 8	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 10	21	56.32	1182.72	1.1827	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Hallway to Class Rm 1 - Main Office	22	56.32	1239.04	1.239	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
Hallway Cl Rm 1 - Main Office Exit S	2	22	44	0.044	2 - 11 WATT BI PIN FLUORESCENT FIXTURE WITH ELECTRONIC BALLAST	2	0	0	0	COOPER SURELITE LED EMERGENCY LIGHT WITH BATTERY BACKUP	0.04
Main Entrance - Lobby Hallway	10	56.32	563.2	0.5632	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	20	10.5	210	0.209999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.35
Cafeteria	66	84.48	5575.68	5.5757	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	198	10.5	2079	2.078999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	3.5
Cafeteria - Storage 1	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Cafeteria - Storage 2	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Kitchen - Main Area	11	112.64	1239.04	1.239	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
Kitchen- Utility Rm	1	42	42	0.042	1- 42 WATT CFL SCREW-IN	1	12	12	0.011999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.03
Kitchen - Womens Bath Rm	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 3000K, DIMMABLE - ENERGY STAR	0.1
Kitchen - Storage	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Kitchen - Sink Area	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Kitchen Closet - No Access	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 3000K, DIMMABLE - ENERGY STAR	0.1
Girls Bath Rm	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Electrical Closet	1	75	75	0.075	PAR 38 FLOOD 75 WATT	1	17	17	0.016999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.06
Restroom	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 3000K, DIMMABLE - ENERGY STAR	0.1
Boys Bath Rm	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Teacher's Cafe	20	84.48	1689.6	1.6896	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
Class Rm 12	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Class Rm 12	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class Rm 13	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
Class RM 14	9	94	846	0.846	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.66
Class Rm 14	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
Class Rm 15	10	94	940	0.94	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	20	10.5	210	0.209999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.73
Class Rm 15	5	56.32	281.6	0.2816	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	10	10.5	105	0.104999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.18
Office RM 16 - Hall	1	94	94	0.094	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Office - Kimberely	2	94	188	0.188	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.15
Office - Special Services # 4	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Office - Special Services # 3	2	94	188	0.188	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.15
Office - Special Services # 3	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Office - Special Services # 2	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Class Rm 17	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
Class Rm 17	8	94	752	0.752	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
Electrical Closet # 6	1	42	42	0.042	1- 42 WATT CFL SCREW-IN	1	12	12	0.011999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.03
Hallway - Class Rms 12-17	11	56.32	619.52	0.6195	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	22	10.5	231	0.230999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.39
Courtyard (By Head Custodian Dr)	2	150	300	0.3	2L PAR 38 FLOOD 75 WATT	2	17	34	0.033999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.27
Class Rm 18	24	94	2256	2.256	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.75
Class Rm 19	9	56.32	506.88	0.5069	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Class Rm 20	15	94	1410	1.41	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.1

Company Internal

Lazar

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Class Rm 21	15	94	1410	1.41	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.1
Class Rm 22	10	56.32	563.2	0.5632	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	20	10.5	210	0.209999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.35
Class Rm 22	5	94	470	0.47	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	10	10.5	105	0.104999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
Class Rm 23	12	94	1128	1.128	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.88
Class Rm 23	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class Rm 24	11	94	1034	1.034	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	22	10.5	231	0.230999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.8
Class Rm 24	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Class Rm 25	11	94	1034	1.034	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	22	10.5	231	0.230999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.8
Class Rm 25	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Class Rm 26	12	94	1128	1.128	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.88
Class Rm 26	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Hallway - Class Rms 18-26	16	56.32	901.12	0.9011	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	32	10.5	336	0.335999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.57
Class Rm 27	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 28	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 29	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 30	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Teacher's Copy Rm	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Mens Rm	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Custodial Closet	1	75	75	0.075	PAR 38 FLOOD 75 WATT	1	17	17	0.016999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.06
Storage Closet 1/2	2	151	302	0.302	4' FIXTURE, 3-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.24
Class Rm 31	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 31 - CAD Drawing Lab	6	56.32	337.92	0.3379	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Class Rm 31 - Tech Office	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 32	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 32 - Laundry Area	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Class Rm 33 - TV Production	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Class Rm 34	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Hallway Class Rms 27-34	15	56.32	844.8	0.8448	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
Head Custodian	0	0	0	0	0 - N/A	3	0	0	0	**** ALREADY LED ****	0
Womens Faculty Bath Rm	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 3000K, DIMMABLE - ENERGY STAR	0.1
Womens Faculty Bath Rm	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
Mrs. Masanko	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Ass't principal office	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Girls Bath rm	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Hallway - Girls Bath Rm - Head Cust	13	56.32	732.16	0.7322	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	26	10.5	273	0.272999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.46
Hallway - By Lockers	11	56.32	619.52	0.6195	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	22	10.5	231	0.230999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.39
Electrical Rm #3	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Electrical Rm # 3	1	172	172	0.172	4' FIXTURE, 4-F40/T12 LAMPS, ENERGY SAVING MAGNETIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.13
Electrical Rm # 3	1	94	94	0.094	4' FIXTURE, 2-F40/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Storage # 8	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Class Rm 35	20	56.32	1126.4	1.1264	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	40	10.5	420	0.419999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.71
Media Rm # 37	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Media Rm # 37A	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Media Rm # 37 - Computer Lab	1	112.64	112.64	0.1126	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Library	44	112.64	4956.16	4.9562	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	176	10.5	1848	1.847999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	3.11
Library - Rm # 1	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Library - Rm # 2	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Library - Rm # 3	1	112.64	112.64	0.1126	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Rm # 38	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Rm # 38	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Rm # 38	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Rm # 39	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Hallway - Near Courtyard and Class	5	56.32	281.6	0.2816	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	10	10.5	105	0.104999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.18
Courtyard & Above Door	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.2
Courtyard	2	150	300	0.3	2L PAR 38 FLOOD 75 WATT	4	17	68	0.067999	PAR38, E26 BASE, 17 WATT, HIGH CRI, 120V 40°, 4000K, DIMMABLE - ENERGY STAR	0.23
Womens Bath Rm	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Girls Bath Rm	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Girls Bath Rm	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Girls Bath Rm	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Boys Bath Rm	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Boys Bath Rm	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Boys Bath Rm	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Custodial Closet	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Custodial Closet	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Mens Faculty Bath Rm	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Electrical Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Hallway	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Hallway	2	60	120	0.12	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.07
Hallway	0	0	0	0	0 - N/A	2	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Class Rm 40 - Instrumentation	15	112.64	1689.6	1.6896	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
Music Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14

Company Internal

Lazar

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Storage	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class Rm 41 - Music	15	112.64	1689.6	1.6896	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
Boiler Rm 2	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class Rm 43	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 42	15	112.64	1689.6	1.6896	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
Storage	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Class Rm 44	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Storage Closet	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class Rm 45	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 46	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 47	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 48	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 49	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 50	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 51	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 52	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 53	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 54	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 55	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Computer Hub	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Custodial Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 56	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 56 - Track Lighting	7	50	350	0.35	PAR 20 FLOOD 50 WATT	7	8	56	0.055999	REFINE PAR20, E26, 8W, 3000K, 15°, HIGH CRI, 120V DIM - ENERGY STAR	0.29
Class Rm 56 - Art Supplies	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class Rm 56 - Ceramics	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 57	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 58	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 58 - Track lighting	7	50	350	0.35	PAR 20 FLOOD 50 WATT	7	8	56	0.055999	REFINE PAR20, E26, 8W, 3000K, 15°, HIGH CRI, 120V DIM - ENERGY STAR	0.29
Class Rm 59	9	112.64	1013.76	1.0138	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Hallway - Courtyard to CL Rm 5 to	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Hallway - Courtyard to Cl Rm 5 to E	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Hallway - Courtyard CL Rm 5 to Ele	7	56.32	394.24	0.3942	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
Hallway - Exit 15 By CL RM 40	10	60	600	0.6	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	30	8	240	0.239999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.36
Hallway - Exit 15 By CL RM 40	0	0	0	0	0 - N/A	10	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Hallway - To CL RM 59	30	56.32	1689.6	1.6896	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	60	10.5	630	0.629999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.06
Electrical Closet	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Electrical Closet	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Custodial Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Mens Faculty Bath Rm	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Mens Faculty Bath Rm	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Womens Faculty Bath rm	1	112.64	112.64	0.1126	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Class Rm 60	18	44.88	807.84	0.8078	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	54	8	432	0.431999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.38
Class Rm 61	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 61	11	112.64	1239.04	1.239	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.78
Class Rm 61 - Storage	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Class Rm 62	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 63	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 64	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 65	12	112.64	1351.68	1.3517	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Hallway	1	112.64	112.64	0.1126	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Hallway	14	44.88	628.32	0.6283	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	42	8	336	0.335999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.29
Hallway	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Gym - Stage Area	24	50	1200	1.2	4' FIXTURE, 1-F40/T12 LAMP, ENERGY SAVING MAGNETIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.95
Gym - Stage Area	4	28.16	112.64	0.1126	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Gym - Stage Electrical Closet 1	1	112.64	112.64	0.1126	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Gym - Stage Electrical Closet 2	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Hallway - to Back of Gym Exit Door	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Gym - Girls Locker Rm	4	82	328	0.328	2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.23
Gym - Girls Locker Rm	0	0	0	0	0 - N/A	4	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Gym - Girls locker Rm - Sink Area	2	80	160	0.16	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.12
Gym - Girls Locker Rm - Office	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Gym - Girls Locker Rm - Bath Rm	1	56	56	0.056	2' FIXTURE, 2-F20/T12/STD LAMPS, STANDARD MAGNETIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Gym - Girls Locker Rm - Shower	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
Gym - Girls Locker Rm - Storage	4	60	240	0.24	A LAMP 60 WATT INCANDESCENT	4	8.5	34	0.033999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.21
Gym - Girls Locker Rm - Locker Are	6	112.64	675.84	0.6758	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Gym - Girls Locker Rm - Locker Are	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
Gym - Boys Locker Rm	2	82	164	0.164	2' FIXTURE, 2-F34/T12/U6 LAMPS, STANDARD MAGNETIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.12
Gym - Boys Locker Rm	0	0	0	0	0 - N/A	2	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Gym - Boys locker Rm Entrance & E	2	112.64	225.28	0.2253	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Gym - Boys Locker Rm- Bath Rm Sir	2	80	160	0.16	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.12
Gym - Boys Locker Rm - Locker Are	4	112.64	450.56	0.4506	*4' FIXTURE, 4-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28

Lazar

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Gym - Boys Locker Rm - Caged Area	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.1
Gym - Storage	1	80	80	0.08	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.06
Gym - Storage	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Gym - Office	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Gym - Office/Electrical Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Exterior - Parking Lot Pole Lights	29	232	6728	6.728	METAL HALIDE, 1-200 WATT LAMP	29	78	2262	2.261999	ALED78 TYPE III WITH 8 POLE MOUNTING ARM NEUTRAL LED BNZ - DLC LISTED	4.47
Exterior - Left Side of School Exit 12	3	128	384	0.384	METAL HALIDE, 1-100 WATT LAMP	3	30	90	0.089999	WALLPACK 30W NEUTRAL LED 277V PCS W/ POLYCARB LENS BZ - DLC LISTED	0.29
Exterior - by Exit 15	2	72	144	0.144	METAL HALIDE, 1-50 WATT LAMP	2	10	20	0.019999	VANDALPROOF CANOPY 10W NEUTRAL LED 120-277V W/ FLAT LENS WH	0.12
Exterior - by Exit 15	1	42	42	0.042	1- 42 WATT CFL SCREW-IN	1	12	12	0.011999	LED A19 12 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.03
Exterior - By Gym Ent/Exit Dr	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W NEUTRAL LED 277V PCS W/ POLYCARB LENS BZ - DLC LISTED	0.1
Exterior - by Solar Electric Controls	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W NEUTRAL LED 277V PCS W/ POLYCARB LENS BZ - DLC LISTED	0.2
Exterior - Exit Dr by Gym	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.1
Exterior - Main Entrance	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	30	60	0.059999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.2
Exterior - Right Side by Exit 22	3	128	384	0.384	METAL HALIDE, 1-100 WATT LAMP	3	30	90	0.089999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.29
Exterior - Back of School	2	232	464	0.464	METAL HALIDE, 1-200 WATT LAMP	2	37	74	0.073999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.39
Exterior - by Exit 18	2	58	116	0.116	2 - 26 WATT CFL QUAD - PIN FIXTURE	2	27	54	0.053999	8" RETROFIT 12/19/27W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STAR	0.06
Exterior - By Exit 19	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	30	30	0.029999	WALLPACK 30W 4000K NEUTRAL LED 120-277V W/ POLYCARB LENS BZ - DLC LISTED	0.1
Gym - Main	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
Non Shunted Sockets	0	0	0	0	0 - N/A	2500	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
FL030 sockets for Bi Level Fixtures	0	0	0	0	0 - N/A	1600	0	0	0	U TUBE SOCKET NON SHUNTED	0
1Lamp Socket Kits	0	0	0	0	0 - N/A	30	0	0	0	1 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
2Lamp Spcket Kits	0	0	0	0	0 - N/A	1400	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
3Lamp Socket Kits	0	0	0	0	0 - N/A	160	0	0	0	3 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4Lamp Socket Kits	0	0	0	0	0 - N/A	75	0	0	0	4 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
4' 10.5 W Tube Closet Stock	0	0	0	0	0 - N/A	175	10.5	1837.5	1.837499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-1.84
	1385	**17610.2**	**120259.8**	**120.2596**		**9776**	**2403.5**	**43412**	**43.411791**		**76.85**

Valley View

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Main Office	8	84.48	675.84	0.6758	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Main Office	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Principal Office - Dr Kennedy	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Main Office - Kitchen	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Nurse's Office	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Nurse's Office	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Nurse's Office - Bath Rm	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Electrical Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Copy Rm	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Faculty Lounge	6	84.48	506.88	0.5069	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	18	10.5	189	0.188999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.32
Faculty Lounge	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Faculty Lounge	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Utility Closet	1	80	80	0.08	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.06
Utility Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Teachers Bath RM 1	1	60	60	0.06	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
Teachers Bath Rm 1	0	0	0	0	0 - N/A	1	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Teachers Bath Rm 2	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Girls Bath Rm	3	44.88	134.64	0.1346	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	9	8	72	0.071999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.06
Girls Bath Rm - Above Sink	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Boys Bath Rm	3	44.88	134.64	0.1346	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	9	8	72	0.071999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.06
Boys Bath Rm - Above Sink	1	84.48	84.48	0.0845	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	3	10.5	31.5	0.031499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.05
Server Rm # 1	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Server Rm # 1	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Storage Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 2	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm # 2 Hall	1	50	50	0.05	4' FIXTURE, 1-F34/T12 LAMP, STANDARD MAGNETIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 3	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Media Center - Office 4	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Class Rm 5	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Class Rm 5	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 6	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 7	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 8	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Boiler Rm	6	28.16	168.96	0.169	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Boiler Rm Dr 2	14	28.16	394.24	0.3942	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	14	10.5	147	0.146999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.25
Office # 9	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Class RM 10	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
Class Rm 11	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
Office # 12	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Office 13	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Office 13	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 14	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Class Rm 15	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
Class Rm 15 - Hall	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Office # 16	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Office # 16	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 17	14	84.48	1182.72	1.1827	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
Class Rm 17	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 17 - Hall to CL Rm 18	2	28.16	56.32	0.0563	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 17 - Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class RM 17 Bath Rm	1	50	50	0.05	4' FIXTURE, 1-F34/T12 LAMP, STANDARD MAGNETIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
CLass Rm 18	15	84.48	1267.2	1.2672	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	45	10.5	472.5	0.472499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.79
Class Rm 18 Bath Rm	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
CLass Rm 18	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 19	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 19	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
Class Rm 19 - Bath Rm	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 20	11	84.48	929.28	0.9293	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	33	10.5	346.5	0.346499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.58
Class Rm 20	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 20 - Bath Rm	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 21	10	84.48	844.8	0.8448	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
Class Rm 21	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Class Rm 21 - Bath Rm	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
Cafeteria - Rm 22	30	84.48	2534.4	2.5344	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	90	18	1620	1.619999	G3 HP 4 FOOT 18W 4000K FROSTED LENS SEP LED TUBE	0.91
Class Rm 25	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 25	4	44.88	179.52	0.1795	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.08
Class Rm 25 - Closet	1	28.16	28.16	0.0282	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	1	10.5	10.5	0.010499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.02
Class Rm 26	16	84.48	1351.68	1.3517	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	48	10.5	504	0.503999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.85
Class Rm 26	4	44.88	179.52	0.1795	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.08

Company Internal

Valley View

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Class Rm 26 - Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 26 Book Club	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 27	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
Class Rm 27	4	44.88	179.52	0.1795	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.08
Class Rm 27 Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Class Rm 28	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
Class Rm 28	4	44.88	179.52	0.1795	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	12	8	96	0.095999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.08
Class Rm 28 - Closet	1	80	80	0.08	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.06
2nd FL - Electrical Closet # 6	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
2nd FL - Teachers Bath Rm	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
2nd FL -Teachers Bath Rm - Sink	1	14.96	14.96	0.015	*2' FIXTURE, 1-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	1	8	8	0.007999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
2nd FL - Girls Bath Rm	3	44.88	134.64	0.1346	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	9	8	72	0.071999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.06
2nd FL - Girls Bath Rm - Sink	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
2nd FL - Class Rm 29	13	84.48	1098.24	1.0982	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	39	10.5	409.5	0.409499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.69
2nd FL - Class Rm 30	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Server Rm	1	80	80	0.08	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.06
2nd FL - Electrical Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
2nd FL - Class Rm 31	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Class Rm 32	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Class Rm 33	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Class Rm 34	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Electrical Closet	1	80	80	0.08	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.06
2nd FL - Storage Closet	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
2nd FL - Class Rm 35	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Class Rm 36	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
2nd FL - Class Rm 37	14	84.48	1182.72	1.1827	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
2nd FL - Class Rm 37	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
2nd FL - Class Rm 38	14	84.48	1182.72	1.1827	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
2nd FL - Class Rm 38	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
2nd FL - Class Rm 39	14	84.48	1182.72	1.1827	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
2nd FL - Class Rm 39	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
2nd FL - Class Rm 40	14	84.48	1182.72	1.1827	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	42	10.5	441	0.440999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.74
2nd FL - Class Rm 40	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
2nd FL - Boys Bath Rm	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
2nd FL - Boys Bath Rm	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
1st FL - Media Rm Pendant Lighting	48	56.32	2703.36	2.7034	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	96	10.5	1008	1.007999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.7
1st FL - Media Center	88	32	2816	2.816	1 - 32 WATT QUAD-PIN CFL	88	21	1848	1.847999	6" RETROFIT 8.5/14.5/21W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STA	0.97
1st FL- Media Center	2	44.88	89.76	0.0898	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
1st FL - Media Center	2	60	120	0.12	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	6	8	48	0.047999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.07
1st FL - Media Center	0	0	0	0	0 - N/A	2	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
1st FL - Electrical Rm	5	84.48	422.4	0.4224	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	15	10.5	157.5	0.157499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.26
1st FL - Electrical Rm Closet	1	44.88	44.88	0.0449	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.02
1st FL - Elevator	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
1st FL - Gym	8	226	1808	1.808	4' FIXTURE, 4-F54/T5/HO/LAMPS, ELECTRONIC BALLAST	8	160	1280	1.279999	2 X 4, HIGH BAY, ECO LINEAR, 160W, 4000K, 120-277VAC, DIMMABLE, PRISMATIC OPTIC - D	0.53
1st FL - Gym Stage	3	226	678	0.678	4' FIXTURE, 4-F54/T5/HO/LAMPS, ELECTRONIC BALLAST	3	160	480	0.479999	2 X 4, HIGH BAY, ECO LINEAR, 160W, 4000K, 120-277VAC, DIMMABLE, PRISMATIC OPTIC - D	0.2
1st FL - Gym Stage	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
1st FL - Gym Recessed Lighting	0	0	0	0	0 - N/A	0	0	0	0	**** ALREADY LED ****	0
1st FL - Gym Closet 1	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
1st FL - Gym Closet 2	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
1st FL - Main Hallway	31	56.32	1745.92	1.7459	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	62	10.5	651	0.650999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.09
1st FL - Main Hallway	8	32	256	0.256	1 - 32 WATT QUAD-PIN CFL	8	21	168	0.167999	6" RETROFIT 8.5/14.5/21W INNOFIT SERIES 4000K 120-277V NON-DIMMABLE - ENERGY STA	0.09
Stairway	8	60	480	0.48	*2' FIXTURE, 2-F32/T8/U6 LAMPS, ELECTRONIC BALLAST	24	8	192	0.191999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.29
Stairway	0	0	0	0	0 - N/A	2	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0
Stairway	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Stairway at Class Rm 24	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Stairway at Gym	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
2nd FL - Upper Hallway	41	56.32	2309.12	2.3091	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	82	10.5	861	0.860999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.45
2nd FL - Upper Hallway	12	44.88	538.56	0.5386	*2' FIXTURE, 3-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	36	8	288	0.287999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.25
2nd FL - Hallway by EC 5	6	28.16	168.96	0.169	*4' FIXTURE, 1-F32/T8 LAMP, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
2nd FL - Hallway 24St	2	80	160	0.16	4' FIXTURE, 2-F34/T12 LAMPS, STANDARD MAGNETIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.12
2nd FL - Hallway 24St	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Exterior - Main Entrance Canopy Li	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	20	40	0.039999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.22
Exterior - Back Entrance - Right Sid	2	172	344	0.344	150 WATT MH WALL PACK	2	37	74	0.073999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.27
Exterior - Back of Building	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building - Left Sid	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building By CL Rm	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building By CL RM	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building By CL Rm	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building By CL Rm	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14

Valley View

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Exterior - Back of Building By Dr 1	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	20	20	0.019999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.11
Exterior - Back of Building By CL RM	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building Left of C	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	20	20	0.019999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.11
Exterior - Back of Building Left of C	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Back of Building By CL RM	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Right Side of Building BY	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
Exterior - Right Side of Building By	2	128	256	0.256	METAL HALIDE, 1-100 WATT LAMP	2	20	40	0.039999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.22
Exterior - Front of Building By CL RI	2	172	344	0.344	150 WATT MH WALL PACK	2	37	74	0.073999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.27
Exterior - Front of Building By CL Rr	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NEUTRAL LED 277V PC W/ GLASS LENS BZ - DLC LISTED	0.14
Exterior - Front of Building By CL Rr	1	128	128	0.128	METAL HALIDE, 1-100 WATT LAMP	1	20	20	0.019999	VANDALPROOF CANOPY 20W 4000K NEUTRAL LED 120-277V W/ DROP LENS BZ	0.11
Exterior - Parking Lot Pole Lights	0	0	0	0	0 - N/A	9	0	0	0	**** ALREADY LED ****	0
Exterior - Parking Lot Pole Lights Ri	4	190	760	0.76	METAL HALIDE, 1-150 WATT LAMP	4	78	312	0.311999	ALED78 TYPE IV WITH 8 POLE MOUNTING ARM NEUTRAL LED BNZ - DLC LISTED	0.45
FL200N Non Shunted Sockets	0	0	0	0	0 - N/A	1900	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
FL030 Sockets for Media Center Pe	0	0	0	0	0 - N/A	50	0	0	0	U TUBE SOCKET NON SHUNTED	0
1 Lamp Socket Kits	0	0	0	0	0 - N/A	30	0	0	0	1 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
2 Lamp Socket Kits	0	0	0	0	0 - N/A	225	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
3 Lamp Socket Kits	0	0	0	0	0 - N/A	535	0	0	0	3 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
2' 8W 4000k Closet Stock	0	0	0	0	0 - N/A	15	8	120	0.119999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	-0.12
4' 10.5W 4000K Closet Stock	0	0	0	0	0 - N/A	85	10.5	892.5	0.892499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-0.89
	863	**11131.92**	**62362.4**	**62.3623**		**4958**	**2190.5**	**26531**	**26.530855**		**35.83**

Company Internal

William Mason

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Main Office	8	56.32	450.56	0.4506	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	16	10.5	168	0.167999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.28
Main Office - Principal	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Main Office - Closet	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	8.5	8.5	0.008499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.05
Bathroom	0	56.32	0	0	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	1	0	0	0	**** ALREADY LED ****	0
Nurse's Office	0	0	0	0	0 - N/A	3	0	0	0	**** ALREADY LED ****	0
Nurse's Office Bathroom	1	78	78	0.078	3-26 WATT CFL IN FIXTURE	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.06
Boys Bathroom	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
Girls Bathroom	0	0	0	0	0 - N/A	2	0	0	0	**** ALREADY LED ****	0
CR 1	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 1 Bathroom	1	78	78	0.078	3-26 WATT CFL IN FIXTURE	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.06
CR 2	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 2 Bathroom	1	78	78	0.078	3-26 WATT CFL IN FIXTURE	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.06
CR 2B	15	56.32	844.8	0.8448	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	30	10.5	315	0.314999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.53
CR 2B Bathroom	1	78	78	0.078	3-26 WATT CFL IN FIXTURE	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.06
CR 3	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 3 Bathroom	1	60	60	0.06	A LAMP 60 WATT INCANDESCENT	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.05
CR 5	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Faculty Room	4	56.32	225.28	0.2253	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	8	10.5	84	0.083999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.14
Faculty Room Bathroom	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
CR 12 Special	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Gym Storage	2	60	120	0.12	A LAMP 60 WATT INCANDESCENT	2	8.5	17	0.016999	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.1
Hall - All	31	56.32	1745.92	1.7459	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	62	10.5	651	0.650999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	1.09
Hall - New Wing	17	56.32	957.44	0.9574	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	34	10.5	357	0.356999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.6
Hall New Wing	4	29.92	119.68	0.1197	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	8	8	64	0.063999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.06
CR 29	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 28	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 30	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 31	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 32	7	84.48	591.36	0.5914	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	21	10.5	220.5	0.220499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.37
Faculty Bathroom	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
Custodian's Room	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Boy's Bathroom	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Boy's Bathroom	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
Girl's Bathroom	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
Girl's Bathroom	1	29.92	29.92	0.0299	*2' FIXTURE, 2-F17/T8/STD LAMPS, (.88) ELECTRONIC BALLAST	2	8	16	0.015999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.01
Electrical Room	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 13	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 14	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 11	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 12	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 9	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 10 OT/PT	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 7	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 8	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Supply Room	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Custodian's Room	2	56.32	112.64	0.1126	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	4	10.5	42	0.041999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.07
CR 6	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
CR 4	12	56.32	675.84	0.6758	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	24	10.5	252	0.251999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.42
Lower Hall	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Lower Hall	1	59	59	0.059	2' FIXTURE, 2-F32/T8/U6 LAMPS, INSTANT START ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
CR 17	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 17 Sink	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 17 Storage	1	58	58	0.058	2 - 26 WATT CFL QUAD - PIN FIXTURE	1	15	15	0.014999	METALUX AP SERIES-ROUND FLUSH MOUNT-15"-21.3W 4000K 1700 LUMEN	0.04
CR 15	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
CR 15 Closet	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
CR 18	12	84.48	1013.76	1.0138	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	36	10.5	378	0.377999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.64
Lower Girl's Bathroom	3	84.48	253.44	0.2534	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	9	10.5	94.5	0.094499	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.16
Lower Janitor	1	56.32	56.32	0.0563	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	2	10.5	21	0.020999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.04
Lower Boy's Bathroom	2	84.48	168.96	0.169	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Lower Boy's Bathroom	1	59	59	0.059	2' FIXTURE, 2-F32/T8/U6 LAMPS, INSTANT START ELECTRONIC BALLAST	3	8	24	0.023999	G4 SP 2 FOOT 8W 4000K 140LPW NANO LENS SEP LED TUBE - DLC LISTED	0.04
CR 16	4	84.48	337.92	0.3379	*4' FIXTURE, 3-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	12	10.5	126	0.125999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.21
Boiler Room	7	42	294	0.294	1- 42 WATT CFL SCREW-IN	7	8.5	59.5	0.059499	LED A19 8.5 WATT, FULLY OMNI E26 BASE, 120V, 4000K, DIMMABLE - ENERGY STAR	0.23
Lower Stairs	3	56.32	168.96	0.169	*4' FIXTURE, 2-F32/T8 LAMPS, (.88) ELECTRONIC BALLAST	6	10.5	63	0.062999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	0.11
Exterior - Front/Main	6	60	360	0.36	A LAMP 60 WATT INCANDESCENT	6	0	0	0	**** ALREADY LED ****	0.36
Exterior - Entrance/Walkway	1	138	138	0.138	HIGH PRESSURE SODIUM, 1-100 WATT LAMP	1	45	45	0.044999	HID LED EX39 45W 120-277V 4000K NON-DIMMABLE	0.09
Exterior - WP near CR 13	1	172	172	0.172	150 WATT MH WALL PACK	1	37	37	0.036999	WALLPACK 37W NUETRAL LED BRONZE - DLC LISTED	0.14
Exterior - Lower CR Door Entrance	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
Exterior - Left Side Lower Door Exit	2	72	144	0.144	METAL HALIDE, 1-50 WATT LAMP	2	12	24	0.023999	BRISK LOW PROFILE WALL PACK, 12 WATT, 4000K, BRONZE - DLC LISTED	0.12
Exterior - Back Boiler Room	0	0	0	0	0 - N/A	1	0	0	0	**** ALREADY LED ****	0
Exterior - Right Side Exit by CR 30	1	172	172	0.172	150 WATT MH WALL PACK	1	24	24	0.023999	WALLPACK 24W NUETRAL LED BRONZE - DLC LISTED	0.15
Exterior - Back by Converter	1	150	150	0.15	2L PAR 38 FLOOD 75 WATT	1	17	17	0.016999	PAR38, E26 BASE, 17 WATT, 120-277V 40°, 4000K, HIGH CRI, NON-DIMMABLE	0.13
Lower Boys Bath Rm/Lower Hall	0	0	0	0	0 - N/A	2	0	0	0	RETROFIT KIT FOR 2' U-TUBE (INCLUDES (3) SOCKETS)	0

Company Internal

William Mason

Location	Current Qty	Current Watts	Total Current Watts	Current kW	Current Lighting Description	Proposed Qty	Proposed Watts	Total Proposed Watts	Proposed kW	Proposed Lighting Description	kW Reduction
Non Shunted Sockets	0	0	0	0	0 - N/A	900	0	0	0	NON-SHUNTED SOCKET, 600V, 660W	0
2 Lamp Socket Kits	0	0	0	0	0 - N/A	290	0	0	0	2 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
3 Lamp Socket Kits	0	0	0	0	0 - N/A	110	0	0	0	3 LAMP UNIVERSAL TOMBSTONE KIT WITH BALLAST DISCONNECT	0
Closet Stock - 4' 10.5W 4000K	0	0	0	0	0 - N/A	44	10.5	462	0.461999	TUBE LIGHT, T8, G4, 10.5W, 4FT, SEP, NANO, 4000K, HIGH EFFICACY - DLC LISTED	-0.46
	423	**4494.16**	**27091.92**	**27.0919**		**2282**	**771**	**10163**	**10.162935**		**16.93**

Company Internal

Montville Township Public Schools
Exhibit D
ECM 1A LED Lighting
Lighting Upgrade and Heating Penalty

*Inputs are blue

Building	Lighting Savings (kWh)	Lighting Savings (kW)	Lighting Hours Check (hrs)
Cedar Hill Elementary School	42,089	22.31	1,887
Hilldale Elementary School	103,045	56.37	1,828
Lazar Middle School	144,116	76.85	1,875
Montville High School	271,046	144.41	1,877
Valley View Elementary School	67,638	35.83	1,888
William Mason Elementary School	31,675	16.93	1,871
Woodmont Elementary School	33,054	18.20	1,816
Administration Building	9,214	4.76	1,936
Totals	701,877	376	

CALCULATIONS

	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
Lighting Derate	0%	0%	0%	0%	0%	0%	0%	0%
Lighting Savings	42,089	103,045	144,116	271,046	67,638	31,675	33,054	9,214
kW Savings	22	56	77	144	36	17	18	5
Heating Season	20	20	20	20	20	20	20	20
** % of Heating Season	38%	38%	38%	38%	38%	38%	38%	38%
***Fraction of Heat to be Made-up	40%	40%	40%	40%	40%	40%	40%	40%
****Annual Equivalent of Lighting kWh Saved in Therms	1,436	3,516	4,917	9,248	2,308	1,081	1,128	9,214
Current Boiler Efficiency	88.0%	92.0%	88.0%	88.0%	88.0%	88.0%	88.0%	100.0%
Heating Penalty (Therms)	(251)	(588)	(860)	(1,617)	(403)	(189)	(197)	(1,417)

Montville Township Public Schools
Exhibit D
ECM 1B Lighting Controls/BMS Integration
Lighting Controls and Heating Penalty

ECM DESCRIPTION

Integrate outside lighting controls in BMS

DATA / ASSUMPTIONS

* Heating Season	20	Weeks
** Fraction of heat to be made-up	40.0%	
Heating Hours (Weather Data)	3,948	Hours
Control Savings as a percentage of Lighting Savings	25%	

** Fraction of the Year Representing the Cooling Season Liberal estimate of the heating season, as there are times during the year when the building is neither heated nor cooled.
*** Fraction of the Lighting Reduction that Has to Be Made Up by Heating a portion of the lighting heat is released at night plus interior zones will have limited heating loads

MEASUREMENT AND VERIFICATION

Option A - The Engineering Calculations are based on 5% of the retrofitted lighting fixtures direct kW measurements and operating hours. The kW Measurements are taken for existing lighting fixtures before removal and for new installed lighting fixtures. Lighting operating hours are agreed by client basis from the audit, logging data, and operating personal input. The occupancy sensors savings are calculated as % of operating hours basebd on logging data and historical statistical data

COMMISSIONING

Confirm lighting operation and occupancy sensors functions

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	8%
Safety Factor (Thermal) =	0%

Relatively high safety factor is used for this ECM because of direct measurements are proven over the time and savings are stipulated

Montville Township Public Schools
Exhibit D
ECM 1B Lighting Controls/BMS Integration
Lighting Controls and Heating Penalty
CALCULATIONS

Detailed energy savings calculations are in the line-by-line calculation sheet

*Inputs are blue

Building	Lighting Controls Savings (kWh)
Cedar Hill Elementary School	55
Hilldale Elementary School	98
Lazar Middle School	3,064
Montville High School	7,238
Valley View Elementary School	3,460
William Mason Elementary School	1,084
Woodmont Elementary School	504
Administration Building	779
Totals	16,281

CALCULATIONS

	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
Lighting Safety Factor								
Lighting Savings	55	98	3,064	7,238	3,460	1,084	504	779
Heating Season	20	20	20	20	20	20	20	20
** % of Heating Season	38%	38%	38%	38%	38%	38%	38%	38%
***Fraction of Heat to be Made-up	40%	40%	40%	40%	40%	40%	40%	40%
****Annual Equivalent of Lighting kWh Saved in Therms	2	3	105	247	118	37	17	27
Current Boiler Efficiency	88.0%	92.0%	88.0%	88.0%	88.0%	88.0%	88.0%	100.0%
Heating Penalty								

Montville Township Public Schools
Exhibit D
ECM 1C Destratification Fans
De-stratifcation fans

ECM DESCRIPTION

Install de-stratification fans in large open ares. Fans will push and hold hot air down to reduce heating losses through the roof and upper section of the outside walls due to reducing the indoor temperature in these sections above the fan.

DATA / ASSUMPTIONS

Heating Hours	3,948	Hours
Roof - R Value (Assume between 1-2" insulation)	9.0	ft2-Deg F-hr/BTU
Wall - R Value (Assume 1/2" Wall Board, 8" LWCC, 4" Brick)	4.5	ft2-Deg F-hr/BTU
Window U Value Single Pane	1.2	Btu/ft2-Deg F-hr
Window U Value Double Pane	1.2	Btu/ft2-Deg F-hr

*Heating efficiency of de-stratification fans assumed at 60%

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify that the installed fans operate. Install clock meter on fans to verify that fans are running 24/7 during heating season

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Fuel savings recovery factor is conservatively set for 0 for the ECM due to the uncertainity in consistency of temperature difference between room and upper level temperatures, electric penalties recovery factor is at 0.

FORMULA

$W_{TOTAL} = W_{FAN} \cdot q \cdot t_{FAN}$

$Q_{SAVINGS} = Q_{TOTAL} \cdot \mu$

$Q_{TOTAL} = Q_{WALL} + Q_{ROOF} + Q_{WIN}$

$Q_{WALL} = \sum_{-5}^{60} ((T_{STRAT} - T_{OCC}) \cdot A_{WALL} \cdot U_{WALL} \cdot t_{OCC}) + ((T_{STRAT} - T_{UNOCC}) \cdot A_{WALL} \cdot U_{WALL} \cdot t_{UNOCC})$
$Q_{WIN} = \sum_{-5}^{60} ((T_{STRAT} - T_{OCC}) \cdot A_{WIN} \cdot U_{WIN} \cdot t_{OCC}) + ((T_{STRAT} - T_{UNOCC}) \cdot A_{WIN} \cdot U_{WIN} \cdot t_{UNOCC})$
$Q_{ROOF} = \sum_{-5}^{60} ((T_{STRAT} - T_{OCC}) \cdot A_{ROOF} \cdot U_{ROOF} \cdot t_{OCC}) + ((T_{STRAT} - T_{UNOCC}) \cdot A_{ROOF} \cdot U_{ROOF} \cdot t_{UNOCC})$

Variable	Building	Label	DHW Quantity
$Q_{SAVINGS}$	Therms	Multi-Purpose Room	Multi-Purpose Room
$\sum_{-5}^{60}$	-	69	69
μ	%	48	48
Q_{TOTAL}	btu	3	3
Q_{WALL}	btu	16	16
Q_{ROOF}	btu	Ceiling Tiles	Ceiling Tiles
Q_{WIN}	btu	Heat loss through windows (above de-stratification fan)	
T_{BIN}	°F	Temperature of respective bin	
T_{OCC}	°F	Existing temperature of space during occupied hours	
T_{UNOCC}	°F	Existing temperature of space during unoccupied hours	
T_{STRAT}	°F	Existing stratified temperature above de-stratification fan) during all heating hours	
t_{OCC}	Hrs	Occupied Bin Hours in respective temperature bin	
t_{UNOCC}	Hrs	Unoccupied Bin Hours in respective temperature bin	
A_{WALL}	ft^2	Exposed wall area adove de-stratification fan	
A_{ROOF}	ft^2	Exposed roof area adove de-stratification fan	
A_{WINDOW}	ft^2	Exposed window area adove de-stratification fan	
U_{WALL}	btu / ft^2 / °F	U-factor of wall	
U_{ROOF}	btu / ft^2 / °F	U-factor of roof	
U_{WIN}	btu / ft^2 / °F	U-factor of windows	
W_{TOTAL}	kWh	Annual electrical consumption of fans	
q	-	Quantity of fans	
W_{FAN}	kW	Input kW of fan	
t_{FAN}	Hrs	Annual run time of de-stratification fan (annual heating hours)	

Montville Township Public Schools
Exhibit D
ECM 1C Destratification Fans
De-stratifcation fans

ASSUMPTIONS / DATA

* Inputs are in blue

Building	Location	Wall Length Perimeter (ft)	Wall Width Perimeter (ft)	Exposed Wall Height above Fan (ft)	Ceiling Height	Ceiling Type	Roof Area (ft^2)	Window Area (ft^2 - above Fan)	Roof U-Factor	Window U-Factor	Wall U-Factor	Temp. at Ceiling (oF)
William Mason Elementary School	Multi-Purpose Room	69	48	3.0	16.0	Ceiling Tiles	3,312	144	0.11	0.83	0.22	95.0
Cedar Hill Elementary School	Multi-Purpose Room	69	48	3.0	16.0	Ceiling Tiles	3,312	144	0.11	0.83	0.22	95.0
Cedar Hill Elementary School	Cafeteria	64	35	0.5	12.0	Ceiling Tiles	2,240	220	0.11	0.83	0.22	95.0
Valley View Elementary School	Multi-Purpose Room	60	48	3.0	19.0	Ceiling Tiles	2,880		0.11	0.83	0.22	95.0
Hilldale Elementary School	Multi-Purpose Room	66	50	3.0	18-24-18	I-Beam	3,300	108	0.11	0.83	0.22	95.0
Woodmont Elementary School	Multi-Purpose Room	69	48	3.0	16.0	Ceiling Tiles	3,312	144	0.11	0.83	0.22	95.0
Lazar Middle School	Cafeteria	80	50	3.0	16.0	Ceiling Tiles	4,000	392	0.11	0.83	0.22	95.0
Lazar Middle School	Gym	90	60	3.0	18.0	Ceiling Tiles	5,400		0.11	0.83	0.22	95.0
Montville High School	Wrestling Room	70	40	3.0	24.0	Truss	2,800	160	0.11	0.83	0.22	95.0
Montville High School	Old Gym	100	90	3.0	34.0	Truss	9,000	256	0.11	0.83	0.22	95.0
							-					
							-					
Totals												

CALCULATIONS

	William Mason Elementary School	Cedar Hill Elementary School	Cedar Hill Elementary School	Valley View Elementary School	Hilldale Elementary School	Woodmont Elementary School	Lazar Middle School	Lazar Middle School	Montville High School	Montville High School
Location #1	Multi-Purpose Room	Multi-Purpose Room	Cafeteria	Multi-Purpose Room	Multi-Purpose Room	Multi-Purpose Room	Cafeteria	Gym	Wrestling Room	Old Gym
Wall Length	69	69	64	60	66	69	80	90	70	100
Wall Width	48	48	35	48	50	48	50	60	40	90
Wall Height Above Fan	3.0	3.0	0.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Roof Area	3,312	3,312	2,240	2,880	3,300	3,312	4,000	5,400	2,800	9,000
Window Area	144	144	220	-	108	144	392	-	160	256
Wall Exposed Area	207	207	(175)	324	240	207	(2)	450	170	314
Roof U-Factor	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Window U-Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Wall U-Factor	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Fan Model	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25	Air Pear 25
Total run hours	3,948	3,948	3,948	3,948	3,948	3,948	3,948	3,948	3,948	3,948
Fan Input watts	35	35	35	35	35	35	35	35	35	35
kwh consumed by fan	138	138	138	138	138	138	138	138	138	138
SF per Fan	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Total Fans	4	4	2	4	4	4	4	6	4	8
Total Kwh Consumed	553	553	276	553	553	553	553	829	553	1,105
Existing Occupied Heating Setpoint	70.0	70.0	70.0	70	70	70	70	70	70	70
Existing Unoccup. Heating Setpoint	65.0	65.0	65.0	65	65	65	65	65	65	65
Diversity Factor	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Boiler Efficiency	88.0%	88.0%	88.0%	88.0%	92.0%	88.0%	88.0%	88.0%	88.0%	88.0%
Additional Electric Usage	(553)	(553)	(276)	(553)	(553)	(553)	(553)	(829)	(553)	(1,105)
Calculated Fuel Savings Therms	653	653	481	480	597	653	943	857	590	1,570
Safety Factor Electric	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Safety Factor Thermal	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Additional Electric usage	(553)	(553)	(276)	(553)	(553)	(553)	(553)	(829)	(553)	(1,105)
Calculated Fuel Savings	653	653	481	480	597	653	943	857	590	1,570

Montville Township Public Schools
Exhibit D
ECM 1C Destratification Fans
De-stratifcation fans

WILLIAM MASON ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	207	3,312	144	0.22	0.11	0.83	167,613	1,340,900	437,250	1,945,763
50 to 55	52.5	109	182	172	463	338	125	207	3,312	144	0.22	0.11	0.83	344,023	2,752,180	897,450	3,993,653
45 to 50	47.5	105	119	142	366	252	114	207	3,312	144	0.22	0.11	0.83	352,533	2,820,260	919,650	4,092,443
40 to 45	42.5	185	155	177	517	334	183	207	3,312	144	0.22	0.11	0.83	611,915	4,895,320	1,596,300	7,103,535
35 to 40	37.5	236	200	241	677	440	237	207	3,312	144	0.22	0.11	0.83	957,548	7,660,380	2,497,950	11,115,878
30 to 35	32.5	237	202	198	637	410	227	207	3,312	144	0.22	0.11	0.83	1,046,558	8,372,460	2,730,150	12,149,168
25 to 30	27.5	121	115	113	349	230	119	207	3,312	144	0.22	0.11	0.83	654,925	5,239,400	1,708,500	7,602,825
20 to 25	22.5	149	68	97	314	178	136	207	3,312	144	0.22	0.11	0.83	654,810	5,238,480	1,708,200	7,601,490
15 to 20	17.5	95	40	46	181	98	83	207	3,312	144	0.22	0.11	0.83	418,083	3,344,660	1,090,650	4,853,393
10 to 15	12.5	39	9	28	76	40	36	207	3,312	144	0.22	0.11	0.83	192,683	1,541,460	502,650	2,236,793
5 to 10	7.5	21	5	5	31	14	17	207	3,312	144	0.22	0.11	0.83	85,215	681,720	222,300	989,235
0 to 5	2.5	4	2	-	6	3	3	207	3,312	144	0.22	0.11	0.83	17,940	143,520	46,800	208,260
-5 to 0	-2.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							5,503,843	44,030,740	14,357,850	63,892,433

CEDAR HILL ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	207	3,312	144	0.22	0.11	0.83	167,613	1,340,900	437,250	1,945,763
50 to 55	52.5	109	182	172	463	338	125	207	3,312	144	0.22	0.11	0.83	344,023	2,752,180	897,450	3,993,653
45 to 50	47.5	105	119	142	366	252	114	207	3,312	144	0.22	0.11	0.83	352,533	2,820,260	919,650	4,092,443
40 to 45	42.5	185	155	177	517	334	183	207	3,312	144	0.22	0.11	0.83	611,915	4,895,320	1,596,300	7,103,535
35 to 40	37.5	236	200	241	677	440	237	207	3,312	144	0.22	0.11	0.83	957,548	7,660,380	2,497,950	11,115,878
30 to 35	32.5	237	202	198	637	410	227	207	3,312	144	0.22	0.11	0.83	1,046,558	8,372,460	2,730,150	12,149,168
25 to 30	27.5	121	115	113	349	230	119	207	3,312	144	0.22	0.11	0.83	654,925	5,239,400	1,708,500	7,602,825
20 to 25	22.5	149	68	97	314	178	136	207	3,312	144	0.22	0.11	0.83	654,810	5,238,480	1,708,200	7,601,490
15 to 20	17.5	95	40	46	181	98	83	207	3,312	144	0.22	0.11	0.83	418,083	3,344,660	1,090,650	4,853,393
10 to 15	12.5	39	9	28	76	40	36	207	3,312	144	0.22	0.11	0.83	192,683	1,541,460	502,650	2,236,793
5 to 10	7.5	21	5	5	31	14	17	207	3,312	144	0.22	0.11	0.83	85,215	681,720	222,300	989,235
0 to 5	2.5	4	2	-	6	3	3	207	3,312	144	0.22	0.11	0.83	17,940	143,520	46,800	208,260
-5 to 0	-2.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							5,503,843	44,030,740	14,357,850	63,892,433

CEDAR HILL ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	(175)	2,240	220	0.22	0.11	0.83	(142,066)	906,889	668,021	1,432,844
50 to 55	52.5	109	182	172	463	338	125	(175)	2,240	220	0.22	0.11	0.83	(291,588)	1,861,378	1,371,104	2,940,894
45 to 50	47.5	105	119	142	366	252	114	(175)	2,240	220	0.22	0.11	0.83	(298,801)	1,907,422	1,405,021	3,013,642
40 to 45	42.5	185	155	177	517	334	183	(175)	2,240	220	0.22	0.11	0.83	(518,650)	3,310,844	2,438,792	5,230,986
35 to 40	37.5	236	200	241	677	440	237	(175)	2,240	220	0.22	0.11	0.83	(811,602)	5,180,933	3,816,313	8,185,643
30 to 35	32.5	237	202	198	637	410	227	(175)	2,240	220	0.22	0.11	0.83	(887,046)	5,662,533	4,171,063	8,946,550
25 to 30	27.5	121	115	113	349	230	119	(175)	2,240	220	0.22	0.11	0.83	(555,104)	3,543,556	2,610,208	5,598,660
20 to 25	22.5	149	68	97	314	178	136	(175)	2,240	220	0.22	0.11	0.83	(555,007)	3,542,933	2,609,750	5,597,677
15 to 20	17.5	95	40	46	181	98	83	(175)	2,240	220	0.22	0.11	0.83	(354,360)	2,262,089	1,666,271	3,573,999
10 to 15	12.5	39	9	28	76	40	36	(175)	2,240	220	0.22	0.11	0.83	(163,315)	1,042,533	767,938	1,647,156
5 to 10	7.5	21	5	5	31	14	17	(175)	2,240	220	0.22	0.11	0.83	(72,227)	461,067	339,625	728,465
0 to 5	2.5	4	2	-	6	3	3	(175)	2,240	220	0.22	0.11	0.83	(15,206)	97,067	71,500	153,361
-5 to 0	-2.5							(175)	2,240	220	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							(175)	2,240	220	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							(175)	2,240	220	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							(4,664,972)	29,779,244	21,935,604	47,049,877

Montville Township Public Schools
Exhibit D
ECM 1C Destratification Fans
De-stratifcation fans

VALLEY VIEW ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	324	2,880	0	0.22	0.11	0.83	262,350	1,166,000.00	-	1,428,350
50 to 55	52.5	109	182	172	463	338	125	324	2,880	0	0.22	0.11	0.83	538,470.00	2,393,200.00	-	2,931,670
45 to 50	47.5	105	119	142	366	252	114	324	2,880	0	0.22	0.11	0.83	551,790.00	2,452,400.00	-	3,004,190
40 to 45	42.5	185	155	177	517	334	183	324	2,880	0	0.22	0.11	0.83	957,780.00	4,256,800.00	-	5,214,580
35 to 40	37.5	236	200	241	677	440	237	324	2,880	0	0.22	0.11	0.83	1,498,770.00	6,661,200.00	-	8,159,970
30 to 35	32.5	237	202	198	637	410	227	324	2,880	0	0.22	0.11	0.83	1,638,090.00	7,280,400.00	-	8,918,490
25 to 30	27.5	121	115	113	349	230	119	324	2,880	0	0.22	0.11	0.83	1,025,100.00	4,556,000.00	-	5,581,100
20 to 25	22.5	149	68	97	314	178	136	324	2,880	0	0.22	0.11	0.83	1,024,920.00	4,555,200.00	-	5,580,120
15 to 20	17.5	95	40	46	181	98	83	324	2,880	0	0.22	0.11	0.83	654,390.00	2,908,400.00	-	3,562,790
10 to 15	12.5	39	9	28	76	40	36	324	2,880	0	0.22	0.11	0.83	301,590.00	1,340,400.00	-	1,641,990
5 to 10	7.5	21	5	5	31	14	17	324	2,880	0	0.22	0.11	0.83	133,380	592,800	-	726,180
0 to 5	2.5	4	2	-	6	3	3	324	2,880	0	0.22	0.11	0.83	28,080.00	124,800.00	-	152,880
-5 to 0	-2.5							324	2,880	0	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							324	2,880	0	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							324	2,880	0	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							8,614,710	38,287,600	-	46,902,310

HILLDALE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	240	3,300	108	0.22	0.11	0.83	194,333	1,336,042	327,938	1,858,313
50 to 55	52.5	109	182	172	463	338	125	240	3,300	108	0.22	0.11	0.83	398,867	2,742,208	673,088	3,814,163
45 to 50	47.5	105	119	142	366	252	114	240	3,300	108	0.22	0.11	0.83	408,733	2,810,042	689,738	3,908,513
40 to 45	42.5	185	155	177	517	334	183	240	3,300	108	0.22	0.11	0.83	709,467	4,877,583	1,197,225	6,784,275
35 to 40	37.5	236	200	241	677	440	237	240	3,300	108	0.22	0.11	0.83	1,110,200	7,632,625	1,873,463	10,616,288
30 to 35	32.5	237	202	198	637	410	227	240	3,300	108	0.22	0.11	0.83	1,213,400	8,342,125	2,047,613	11,603,138
25 to 30	27.5	121	115	113	349	230	119	240	3,300	108	0.22	0.11	0.83	759,333	5,220,417	1,281,375	7,261,125
20 to 25	22.5	149	68	97	314	178	136	240	3,300	108	0.22	0.11	0.83	759,200	5,219,500	1,281,150	7,259,850
15 to 20	17.5	95	40	46	181	98	83	240	3,300	108	0.22	0.11	0.83	484,733	3,332,542	817,988	4,635,263
10 to 15	12.5	39	9	28	76	40	36	240	3,300	108	0.22	0.11	0.83	223,400	1,535,875	376,988	2,136,263
5 to 10	7.5	21	5	5	31	14	17	240	3,300	108	0.22	0.11	0.83	98,800	679,250	166,725	944,775
0 to 5	2.5	4	2	-	6	3	3	240	3,300	108	0.22	0.11	0.83	20,800	143,000	35,100	198,900
-5 to 0	-2.5							240	3,300	108	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							240	3,300	108	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							240	3,300	108	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							6,381,267	43,871,208	10,768,388	61,020,863

WOODMONT ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	207	3,312	144	0.22	0.11	0.83	167,613	1,340,900	437,250	1,945,763
50 to 55	52.5	109	182	172	463	338	125	207	3,312	144	0.22	0.11	0.83	344,023	2,752,180	897,450	3,993,653
45 to 50	47.5	105	119	142	366	252	114	207	3,312	144	0.22	0.11	0.83	352,533	2,820,260	919,650	4,092,443
40 to 45	42.5	185	155	177	517	334	183	207	3,312	144	0.22	0.11	0.83	611,915	4,895,320	1,596,300	7,103,535
35 to 40	37.5	236	200	241	677	440	237	207	3,312	144	0.22	0.11	0.83	957,548	7,660,380	2,497,950	11,115,878
30 to 35	32.5	237	202	198	637	410	227	207	3,312	144	0.22	0.11	0.83	1,046,558	8,372,460	2,730,150	12,149,168
25 to 30	27.5	121	115	113	349	230	119	207	3,312	144	0.22	0.11	0.83	654,925	5,239,400	1,708,500	7,602,825
20 to 25	22.5	149	68	97	314	178	136	207	3,312	144	0.22	0.11	0.83	654,810	5,238,480	1,708,200	7,601,490
15 to 20	17.5	95	40	46	181	98	83	207	3,312	144	0.22	0.11	0.83	418,083	3,344,660	1,090,650	4,853,393
10 to 15	12.5	39	9	28	76	40	36	207	3,312	144	0.22	0.11	0.83	192,683	1,541,460	502,650	2,236,793
5 to 10	7.5	21	5	5	31	14	17	207	3,312	144	0.22	0.11	0.83	85,215	681,720	222,300	989,235
0 to 5	2.5	4	2	-	6	3	3	207	3,312	144	0.22	0.11	0.83	17,940	143,520	46,800	208,260
-5 to 0	-2.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							207	3,312	144	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							5,503,843	44,030,740	14,357,850	63,892,433

Montville Township Public Schools
Exhibit D
ECM 1C Destratification Fans
De-stratifcation fans

LAZAR MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	(2)	4,000	392	0.22	0.11	0.83	(1,619)	1,619,444	1,190,292	2,808,117
50 to 55	52.5	109	182	172	463	338	125	(2)	4,000	392	0.22	0.11	0.83	(3,324)	3,323,889	2,443,058	5,763,623
45 to 50	47.5	105	119	142	366	252	114	(2)	4,000	392	0.22	0.11	0.83	(3,406)	3,406,111	2,503,492	5,906,197
40 to 45	42.5	185	155	177	517	334	183	(2)	4,000	392	0.22	0.11	0.83	(5,912)	5,912,222	4,345,483	10,251,793
35 to 40	37.5	236	200	241	677	440	237	(2)	4,000	392	0.22	0.11	0.83	(9,252)	9,251,667	6,799,975	16,042,390
30 to 35	32.5	237	202	198	637	410	227	(2)	4,000	392	0.22	0.11	0.83	(10,112)	10,111,667	7,432,075	17,533,630
25 to 30	27.5	121	115	113	349	230	119	(2)	4,000	392	0.22	0.11	0.83	(6,328)	6,327,778	4,650,917	10,972,367
20 to 25	22.5	149	68	97	314	178	136	(2)	4,000	392	0.22	0.11	0.83	(6,327)	6,326,667	4,650,100	10,970,440
15 to 20	17.5	95	40	46	181	98	83	(2)	4,000	392	0.22	0.11	0.83	(4,039)	4,039,444	2,968,992	7,004,397
10 to 15	12.5	39	9	28	76	40	36	(2)	4,000	392	0.22	0.11	0.83	(1,862)	1,861,667	1,368,325	3,228,130
5 to 10	7.5	21	5	5	31	14	17	(2)	4,000	392	0.22	0.11	0.83	(823)	823,333	605,150	1,427,660
0 to 5	2.5	4	2	-	6	3	3	(2)	4,000	392	0.22	0.11	0.83	(173)	173,333	127,400	300,560
-5 to 0	-2.5							(2)	4,000	392	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							(2)	4,000	392	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							(2)	4,000	392	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							(53,177)	53,177,222	39,085,258	92,209,303

LAZAR MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	450	5,400	0	0.22	0.11	0.83	364,375	2,186,250	-	2,550,625
50 to 55	52.5	109	182	172	463	338	125	450	5,400	0	0.22	0.11	0.83	747,875	4,487,250	-	5,235,125
45 to 50	47.5	105	119	142	366	252	114	450	5,400	0	0.22	0.11	0.83	766,375	4,598,250	-	5,364,625
40 to 45	42.5	185	155	177	517	334	183	450	5,400	0	0.22	0.11	0.83	1,330,250	7,981,500	-	9,311,750
35 to 40	37.5	236	200	241	677	440	237	450	5,400	0	0.22	0.11	0.83	2,081,625	12,489,750	-	14,571,375
30 to 35	32.5	237	202	198	637	410	227	450	5,400	0	0.22	0.11	0.83	2,275,125	13,650,750	-	15,925,875
25 to 30	27.5	121	115	113	349	230	119	450	5,400	0	0.22	0.11	0.83	1,423,750	8,542,500	-	9,966,250
20 to 25	22.5	149	68	97	314	178	136	450	5,400	0	0.22	0.11	0.83	1,423,500	8,541,000	-	9,964,500
15 to 20	17.5	95	40	46	181	98	83	450	5,400	0	0.22	0.11	0.83	908,875	5,453,250	-	6,362,125
10 to 15	12.5	39	9	28	76	40	36	450	5,400	0	0.22	0.11	0.83	418,875	2,513,250	-	2,932,125
5 to 10	7.5	21	5	5	31	14	17	450	5,400	0	0.22	0.11	0.83	185,250	1,111,500	-	1,296,750
0 to 5	2.5	4	2	-	6	3	3	450	5,400	0	0.22	0.11	0.83	39,000	234,000	-	273,000
-5 to 0	-2.5							450	5,400	0	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							450	5,400	0	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							450	5,400	0	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							11,964,875	71,789,250	-	83,754,125

MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	170	2,800	160	0.22	0.11	0.83	137,653	1,133,611	485,833	1,757,097
50 to 55	52.5	109	182	172	463	338	125	170	2,800	160	0.22	0.11	0.83	282,531	2,326,722	997,167	3,606,419
45 to 50	47.5	105	119	142	366	252	114	170	2,800	160	0.22	0.11	0.83	289,519	2,384,278	1,021,833	3,695,631
40 to 45	42.5	185	155	177	517	334	183	170	2,800	160	0.22	0.11	0.83	502,539	4,138,556	1,773,667	6,414,761
35 to 40	37.5	236	200	241	677	440	237	170	2,800	160	0.22	0.11	0.83	786,392	6,476,167	2,775,500	10,038,058
30 to 35	32.5	237	202	198	637	410	227	170	2,800	160	0.22	0.11	0.83	859,492	7,078,167	3,033,500	10,971,158
25 to 30	27.5	121	115	113	349	230	119	170	2,800	160	0.22	0.11	0.83	537,861	4,429,444	1,898,333	6,865,639
20 to 25	22.5	149	68	97	314	178	136	170	2,800	160	0.22	0.11	0.83	537,767	4,428,667	1,898,000	6,864,433
15 to 20	17.5	95	40	46	181	98	83	170	2,800	160	0.22	0.11	0.83	343,353	2,827,611	1,211,833	4,382,797
10 to 15	12.5	39	9	28	76	40	36	170	2,800	160	0.22	0.11	0.83	158,242	1,303,167	558,500	2,019,908
5 to 10	7.5	21	5	5	31	14	17	170	2,800	160	0.22	0.11	0.83	69,983	576,333	247,000	893,317
0 to 5	2.5	4	2	-	6	3	3	170	2,800	160	0.22	0.11	0.83	14,733	121,333	52,000	188,067
-5 to 0	-2.5							170	2,800	160	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							170	2,800	160	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							170	2,800	160	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							4,520,064	37,224,056	15,953,167	57,697,286

Montville Township Public Schools
Exhibit D
ECM 1C Destratification Fans
De-stratifcation fans

MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	$btu/ft^2/°F$	$btu/ft^2/°F$	$btu/ft^2/°F$	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	86	144	97	327	238	89	314	9,000	256	0.22	0.11	0.83	254,253	3,643,750	777,333	4,675,336
50 to 55	52.5	109	182	172	463	338	125	314	9,000	256	0.22	0.11	0.83	521,851	7,478,750	1,595,467	9,596,067
45 to 50	47.5	105	119	142	366	252	114	314	9,000	256	0.22	0.11	0.83	534,759	7,663,750	1,634,933	9,833,443
40 to 45	42.5	185	155	177	517	334	183	314	9,000	256	0.22	0.11	0.83	928,219	13,302,500	2,837,867	17,068,586
35 to 40	37.5	236	200	241	677	440	237	314	9,000	256	0.22	0.11	0.83	1,452,512	20,816,250	4,440,800	26,709,562
30 to 35	32.5	237	202	198	637	410	227	314	9,000	256	0.22	0.11	0.83	1,587,532	22,751,250	4,853,600	29,192,382
25 to 30	27.5	121	115	113	349	230	119	314	9,000	256	0.22	0.11	0.83	993,461	14,237,500	3,037,333	18,268,294
20 to 25	22.5	149	68	97	314	178	136	314	9,000	256	0.22	0.11	0.83	993,287	14,235,000	3,036,800	18,265,087
15 to 20	17.5	95	40	46	181	98	83	314	9,000	256	0.22	0.11	0.83	634,193	9,088,750	1,938,933	11,661,876
10 to 15	12.5	39	9	28	76	40	36	314	9,000	256	0.22	0.11	0.83	292,282	4,188,750	893,600	5,374,632
5 to 10	7.5	21	5	5	31	14	17	314	9,000	256	0.22	0.11	0.83	129,263	1,852,500	395,200	2,376,963
0 to 5	2.5	4	2	-	6	3	3	314	9,000	256	0.22	0.11	0.83	27,213	390,000	83,200	500,413
-5 to 0	-2.5							314	9,000	256	0.22	0.11	0.83	-	-	-	-
-10 to -5	-7.5							314	9,000	256	0.22	0.11	0.83	-	-	-	-
-15 to -10	-12.5							314	9,000	256	0.22	0.11	0.83	-	-	-	-
Total		1,387	1,241	1,316	3,944	2,575	1,369							8,348,824	119,648,750	25,525,067	153,522,641

Montville Township Public Schools
Exhibit D
ECM 1D Vending Misers
Vending Misers

ECM DESCRIPTION

Install vending machines with vending misers, mounted on the respective vending machine.

DATA / ASSUMPTIONS

Cold Drink Run Hour Reduction	34%	
Snack Machine Run Hour Reduction	40%	
Typical Cold Drink Wattage	0.339	kW
Typical Snack Machine Wattage	0.041	kW

MEASUREMENT AND VERIFICATION

Option A -Pre M&V: Measurement of KW for 5% sample machines in each category Energy Savings scope with measured KW and compare to pre retrofit calculated savings.

COMMISSIONING

Confirm vending miser operation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

Relatively high safety factor is used for this ECM because of direct measurements are proven over the time and savings are stipulated

CALCULATIONS

Detailed energy savings calculations are in the line-by-line calculation sheet

*Inputs are blue

Building	Label	Type	Qty	Location
Montville High School	MHS-VM-1	Cold Beverage	1	Cafeteria
Montville High School	MHS-VM-2	Cold Beverage	1	Cafeteria
Montville High School	MHS-VM-3	Cold Beverage	1	Cafeteria
Montville High School	MHS-VM-4	Cold Beverage	1	Cafeteria
Montville High School	MHS-VM-5	Cold Beverage	1	Cafeteria
Montville High School	MHS-VM-6	Cold Beverage	1	Cafeteria
Montville High School	MHS-VM-7	Cold Beverage	1	Auditorium
Building	Label	DHW Quantity	1	Auditorium
Montville High School			1	Auditorium
Lazar Middle School			1	Cafeteria
Lazar Middle School			1	Cafeteria
Lazar Middle School			1	Cafeteria
Lazar Middle School	-	-	1	Cafeteria
Lazar Middle School	-	-	1	Cafeteria
Valley View Elementary School	VV-VM-1	Cold Beverage	1	Teachers Room
Woodmont Elementary School	WM-VM-1	Cold Beverage	1	Teachers Room
Hilldale Elementary School	HD-VM-1	Cold Beverage	1	Teachers Room
Cedar Hill Elementary School	CH-VM-1	Cold Beverage	1	Teachers Room
Cedar Hill Elementary School	CH-VM-2	Snack	1	Teachers Room
William Mason Elementary School	WM-VM-1	Cold Beverage	1	Teachers Room
Administration Building	AB-VM-1	Cold Beverage	1	Break Room
Totals	-	-	**21**	-

CALCULATION

	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Building	Montville High School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Valley View Elementary School	Woodmont Elementary School	Hilldale Elementary School	Cedar Hill Elementary School	Cedar Hill Elementary School	William Mason Elementary School	Administration Building
Label	MHS-VM-1	MHS-VM-2	MHS-VM-3	MHS-VM-4	MHS-VM-5	MHS-VM-6	MHS-VM-7	Label					-	-	VV-VM-1	WM-VM-1	HD-VM-1	CH-VM-1	CH-VM-2	WM-VM-1	AB-VM-1
Type	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	DHW Quantity					-	-	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	Snack	Cold Beverage	Cold Beverage
Location	Cafeteria	Cafeteria	Cafeteria	Cafeteria	Cafeteria	Cafeteria	Auditorium	Auditorium	Auditorium	Cafeteria	Cafeteria	Cafeteria	Cafeteria	Cafeteria	Teachers Room	Teachers Room	Teachers Room	Teachers Room	Teachers Room	Teachers Room	Break Room
Quantity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Run Hours	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
Existing kWh Consumption	2,970	2,970	2,970	2,970	2,970	2,970	2,970	359	359	359	359	359	359	359	2,970	2,970	2,970	2,970	359	2,970	2,970
Proposed kWh Consumption	1,960	1,960	1,960	1,960	1,960	1,960	1,960	215	215	215	215	215	215	215	1,960	1,960	1,960	1,960	215	1,960	1,960
Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
kWh Savings	1,010	1,010	1,010	1,010	1,010	1,010	1,010	144	144	144	144	144	144	144	1,010	1,010	1,010	1,010	144	1,010	1,010

Montville Township Public Schools
Exhibit D
ECM 1E Plug Load Management
Smart Strips and Smart Board Projectors

ECM DESCRIPTION

Install BERT plug load management plug on the various plug loads throughout the district. Integrate equipment onto a central wifi network to schedule these pieces of equipment

DATA / ASSUMPTIONS

Electrical Power Draw When OFF

Cold Beverage Machines	384	W
Snack Machines	60	W
Large Copiers	30	W
Small Printers / Copiers	20	W
Monitor Combos (Printer)	30	W
Laptop Charging Carts	35	W
Projectors	21	W
Water Fountains	6	W
Coffee Machines	60	W
Hot / Cold Water Machines	60	W
XXXs	0	W
XXXs	0	W
XXXs	0	W
XXXs	0	W
XXXs	0	W

Annual Savings for smart strips and smart board projectors are based on logging results for the various pieces of equipment

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements over a defined time period of the existing plug load and post BERT device. A population will be measured before the switch to the BERT devices to determine a baseline usage during a defined time period.

COMMISSIONING

Review installation and network integration with the IT department

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%

The safety factor for this ECM is taken at 0 due to conserative run hours based on data logging results.

Montville Township Public Schools
Exhibit D
ECM 1E Plug Load Management
Smart Strips and Smart Board Projectors

FORMULAE

$W_{TOTAL} = (W_{STRIPS} \cdot Strips_{\#}) + (W_{PROJECTORS} \cdot Projectors_{\#})$

	Building	Label	DHW Quantity
		0	**0**
Variable	Units	0	0
W_{TOTAL}	kWh	0	0
W_{STRIPS}	kWh	0	0
$W_{PROJECTORS}$	kWh	0	0
$Strips_{\#}$	-	0	0
$Projectors_{\#}$	-	Numbers of Projectors	

* Inputs are in blue

Building	Cold Beverage Machines	Snack Machines	Large Copiers	Small Printers / Copiers	Monitor Combos (Printer)	Laptop Charging Carts	Projectors	Water Fountains	Coffee Machines
Cedar Hill Elementary School			3	4		6	42	6	
Hilldale Elementary School			3	7		9	36	1	2
Lazar Middle School			12	15		20	40	10	
Montville High School			12	59		32	111	6	5
Valley View Elementary School			4	15		1	50	6	
William Mason Elementary School			3	5		6	40	1	6
Woodmont Elementary School			4	6		6	46	6	2
Administration Building			7	12			1	1	3
Totals	-	-	48	123	-	80	366	37	18

Montville Township Public Schools
Exhibit D
ECM 1E Plug Load Management
Smart Strips and Smart Board Projectors

CALCULATIONS

	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
Cold Beverage Machines	-	-	-	-	-	-	-	-
Snack Machines	-	-	-	-	-	-	-	-
Large Copiers	3	3	12	12	4	3	4	7
Small Printers / Copiers	4	7	15	59	15	5	6	12
Monitor Combos (Printer)	-	-	-	-	-	-	-	-
Laptop Charging Carts	6	9	20	32	1	6	6	-
Projectors	42	36	40	111	50	40	46	1
Water Fountains	6	1	10	6	6	1	6	1
Coffee Machines	-	2	-	5	-	6	2	3
Total Devices	61	58	97	225	76	61	70	24
Total BERTs	61	58	97	225	76	61	70	24
kW Electrical Draw	1.298	1.427	2.260	5.327	1.541	1.606	1.572	0.657
Unoccupied Hours / Day	13.3	13.3	13.3	13.3	13.3	13.3	13.3	24.0
Unoccupied Hours / Yr	4,849	4,849	4,849	4,849	4,849	4,849	4,849	8,760
kWh Savings	6,294	6,920	10,959	25,832	7,473	7,788	7,623	5,755
Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%
kWh Savings	6,294	6,920	10,959	25,832	7,473	7,788	7,623	5,755

Montville Township Public Schools
Exhibit D
ECM 2A 500 & 600 Wing Airedale Replacements
Airdale Replacements

ECM DESCRIPTION

Replace existing Unitary Units with high efficiency units

DATA / ASSUMPTIONS

Unitary Supply Air Temperature is assumed at, unless stated otherwise 85 °F
Full Load is estimated at 11°F for heating and 92.5°F for cooling unless stated otherwise

MEASUREMENT AND VERIFICATION

Option A (Electric) - Direct kW and savings measurements before and after installation conducted. A report is generated showing the reduction in kW
Option C (Fuel) - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify all functions of the Unitary system, safety and operation.

RECOVERY/SAFETY FACTOR

Safety Factor (Thermal) = 0%

A safety factor of 0 is used due to minimal variables and the proven results of this measure

FORMULAE

$W_{SAVINGS} = W_C - W_C$

$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$
$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$Q_{SAVINGS} = \sum_{-5}^{60} Q_{INPUT} - Q_{INPUT}$

QINPUT = ∑{ Building
QINPUT = ∑60-5 (tOCC · QLOAD · L%) / ηUnitary

$Q_{LOAD} = \sum_{-5}^{60} 1.08 \cdot CFM_{SUPPLY} \cdot (T_{SUPPLY} - T_{MIXED})$

$T_{RISE} = \sum_{-5}^{60} T_{SUPPLY} - T_{MIXED}$

$T_{MIXED} = \sum_{-5}^{60} ((CFM_{RETURN} \cdot T_{RETURN}) + (CFM_{OA} \cdot T_{BIN})) / (CFM_{RETURN} + CFM_{OA})$

Label	DHW Quantity
Existing Input heat p	Proposed Input heat provided by Unitarys at respective bin temperature
0	0
0	0
0	0
0	0
0	0

Montville Township Public Schools
Exhibit D
ECM 2A 500 & 600 Wing Airedale Replacements
Airdale Replacements

Variable	Units	Description	
$W_{SAVINGS}$	kWh	Electrical Savings	
W_C	kWh	Existing Unitary Consumption	
W_C	kWh	Proposed Unitary Consumption	
$\eta_{\%}$	%	Efficiency gain due to Unitary optimization	
$\sum_{60}^{105}$	-	Summation of all bins from 60°F to 105°F	
C	Ton	Tonnage of Unitary	
η	-	Existing efficiency of Unitary (EER)	
η	-	Proposed efficiency of Unitary (EER)	
T_{DESIGN}	°F	Design Temperature of Unitary (Usually 97.5°F)	
T_{BIN}	°F	Bin Weather Temperature	
T_{OCC}	°F	Temperature of building during occupied hours	
T_{UNOCC}	°F	Temperature of building during unoccupied hours	
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin	
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin	
$Q_{SAVINGS}$	Therms	Thermal Savings	
$\sum_{-5}^{60}$	-	Summation of all bins from -5°F to 60°F	
T_{BIN}	°F	Temperature of respective bin	
Q_{INPUT}	Therms	Existing Input heat provided by Unitarys at respective bin temperature	
Q_{INPUT}	Therms	Proposed Input heat provided by Unitarys at respective bin temperature	
Q_{LOAD}	Therms	Heat load on the unit vent	**45%**
$L_{\%}$	%	Load % at respective bin	
T_{RISE}	°F	Temperature rise across the coil (100% Design at 10°F)	
T_{MIXED}	°F	Mixed air temperature	
T_{SUPPLY}	Hrs	Temperature of supply air	
T_{RETURN}	Hrs	Temperature of return air	
CFM_{SUPPLY}	CFM	Total supply CFM of unit vent	
CFM_{OA}	CFM	Total outside air CFM of unit vent	
CFM_{RETURN}	CFM	Total return air CFM of unit vent	
q	-	Quantity of replaced/refurbished Unitarys	
η_{REFURB}	**%**	Efficiency improvement of refurbished unit vent	
$\eta_{REPLACE}$	**%**	Efficiency improvement of replaced unit vent	
t_{OCC}	Hrs	Occupied Bin Hours in respective temperature bin	

* Inputs are in blue
*Checks against baseline are in purple

Montville Township Public Schools
Exhibit D
ECM 2A 500 & 600 Wing Airedale Replacements
Airdale Replacements
CALCULATIONS

	Montville High School	Montville High School	Montville High School
Label	MHS-UV-1-6	MHS-UV-7-11	MHS-UV-12-21
Fuel Switch	N	N	N
Existing Thermal Fuel	Natural Gas	Natural Gas	Natural Gas
Proposed Thermal Fuel	Natural Gas	Natural Gas	Natural Gas
Area Serving	500,501,502,503,504	M 513,514,518,615,61	0,602,603,604,607,610,6
Quantity	6	5	10
Unitary Tonnage	3.0	2.0	4.0
Unitary Supply Air CFM	1,200	800	1,600
Unitary Fresh Air CFM	180	120	240
Unitary Return Air CFM	1,020	680	1,360
Current Thermal Efficiency	80%	80%	80%
Proposed Thermal Efficiency	82%	82%	82%
Current EER	9.0	9.0	9.0
Proposed EER	14.4	14.1	16.1
Existing Occupied Heating Setpoint	70.0	70.0	70.0
Existing Unoccupied Heating Setpoint	65.0	65.0	65.0
Existing Occupied Cooling Setpoint	75.0	75.0	75.0
Existing Unoccupied Cooling Setpoint	80.0	80.0	80.0
Supply Air Temperature	85.0	85.0	85.0
Current Unitary kWh Consumption	3,096	2,142	4,285
Current Unitary Thermal Consumption	839	559	1,118
Percent of Electric Baseline Consumption	0.1%	0.1%	0.2%
Percent of Thermal Baseline Consumption	0.8%	0.6%	1.1%
Proposed Unitary kWh Consumption	1,935	1,367	2,395
Proposed Unitary Thermal Consumption	818	545	1,091
Safety Factor	0%	0%	0%
Electrical Savings	1,161	775	1,889
Natural Gas Savings	20	14	27
Fuel Oil #2 Savings	-	-	-
Fuel Oil #4 Savings	-	-	-
Fuel Oil #6 Savings	-	-	-
Propane Savings	-	-	-

MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	1	-	1	1	-	3.0	3.0	3	-	4	3	2
95 to 100	97.5	-	19	2	21	21	1	3.0	3.0	62	2	84	53	32
90 to 95	92.5	-	44	13	57	54	3	3.0	3.0	161	10	228	143	86
85 to 90	87.5	1	167	60	228	212	16	2.1	1.3	441	20	615	384	231
80 to 85	82.5	31	283	162	476	412	64	1.6	0.4	666	27	924	578	347
75 to 80	77.5	191	235	280	706	493	213	1.2	-	569	-	758	474	284
70 to 75	72.5	203	177	222	602	394	208	0.7	-	273	-	364	227	136
65 to 70	67.5	325	165	204	694	399	295	0.2	-	92	-	123	77	46
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	-	-	-
Total		931	1,242	1,138	3,311	2,328	983	11.8	7.7	2,263	59	3,096	1,935	1,162

Montville Township Public Schools
Exhibit D
ECM 2A 500 & 600 Wing Airedale Replacements
Airdale Replacements

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Mixed Air Temp	Temp rise across coil	Heat Load on the unit	Load % at bin O/A temp (Note 1)	Heat provided by unit
HEATING								°F	°F	btu/hr	%	Btu/Yr
55 to 60	57.5	86	144	97	327	238	89	63.9	21.1	27,378	73.8%	4,813,776
50 to 55	52.5	109	182	172	463	338	125	63.1	21.9	28,350	76.4%	7,328,135
45 to 50	47.5	105	119	142	366	252	114	62.4	22.6	29,322	79.0%	5,834,534
40 to 45	42.5	185	155	177	517	334	183	61.6	23.4	30,294	81.7%	8,262,457
35 to 40	37.5	236	200	241	677	440	237	60.9	24.1	31,266	84.3%	11,587,774
30 to 35	32.5	237	202	198	637	410	227	60.1	24.9	32,238	86.9%	11,479,016
25 to 30	27.5	121	115	113	349	230	119	59.4	25.6	33,210	89.5%	6,837,779
20 to 25	22.5	149	68	97	314	178	136	58.6	26.4	34,182	92.1%	5,606,147
15 to 20	17.5	95	40	46	181	98	83	57.9	27.1	35,154	94.8%	3,272,891
10 to 15	12.5	39	9	28	76	40	36	57.1	27.9	36,126	97.4%	1,398,384
5 to 10	7.5	21	5	5	31	14	17	56.4	28.6	37,098	100.0%	519,372
0 to 5	2.5	4	2	-	6	3	3	55.6	29.4	38,070	100.0%	114,210
-5 to 0	-2.5	4	-	-	4	1	3	54.9	30.1	39,042	100.0%	39,042
-10 to -5	-7.5	-	-	-	-	-	-	54.1	30.9	40,014	100.0%	-
-15 to -10	-12.5	-	-	-	-	-	-	53.4	31.6	40,986	100.0%	-
Total		1,391	1,241	1,316	3,948	2,338	1,372					67,093,515

MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption (kWh)	Proposed Condensing Unit Consumption (kWh)	Savings (kWh)
COOLING														
100 to 105	102.5	-	1	-	1	1	-	2.0	2.0	2	-	3	2	1
95 to 100	97.5	-	19	2	21	21	1	2.0	2.0	41	1	56	36	20
90 to 95	92.5	-	44	13	57	54	3	2.0	2.0	108	7	152	97	55
85 to 90	87.5	1	167	60	228	212	16	1.4	1.4	294	22	421	269	152
80 to 85	82.5	31	283	162	476	412	64	1.1	1.1	444	69	683	436	247
75 to 80	77.5	191	235	280	706	493	213	0.8	-	379	-	505	323	183
70 to 75	72.5	203	177	222	602	394	208	0.5	-	182	-	243	155	88
65 to 70	67.5	325	165	204	694	399	295	0.2	-	61	-	82	52	30
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	-	-	-
Total		931	1,242	1,138	3,311	2,328	983	7.8	6.5	1,509	98	2,142	1,367	776

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Mixed Air Temp	Temp rise across coil	Heat Load on the unit	Load % at bin O/A temp (Note 1)	Heat provided by unit
HEATING								°F	°F	btu/hr	%	Btu/Yr
55 to 60	57.5	86	144	97	327	238	89	63.9	21.1	18,252	73.8%	3,209,184
50 to 55	52.5	109	182	172	463	338	125	63.1	21.9	18,900	76.4%	4,885,423
45 to 50	47.5	105	119	142	366	252	114	62.4	22.6	19,548	79.0%	3,889,689
40 to 45	42.5	185	155	177	517	334	183	61.6	23.4	20,196	81.7%	5,508,305
35 to 40	37.5	236	200	241	677	440	237	60.9	24.1	20,844	84.3%	7,725,182
30 to 35	32.5	237	202	198	637	410	227	60.1	24.9	21,492	86.9%	7,652,677
25 to 30	27.5	121	115	113	349	230	119	59.4	25.6	22,140	89.5%	4,558,520
20 to 25	22.5	149	68	97	314	178	136	58.6	26.4	22,788	92.1%	3,737,431
15 to 20	17.5	95	40	46	181	98	83	57.9	27.1	23,436	94.8%	2,181,927
10 to 15	12.5	39	9	28	76	40	36	57.1	27.9	24,084	97.4%	932,256
5 to 10	7.5	21	5	5	31	14	17	56.4	28.6	24,732	100.0%	346,248
0 to 5	2.5	4	2	-	6	3	3	55.6	29.4	25,380	100.0%	76,140
-5 to 0	-2.5	4	-	-	4	1	3	54.9	30.1	26,028	100.0%	26,028
-10 to -5	-7.5	-	-	-	-	-	-	54.1	30.9	26,676	100.0%	-
-15 to -10	-12.5	-	-	-	-	-	-	53.4	31.6	27,324	100.0%	-
Total		1,391	1,241	1,316	3,948	2,576	1,372					44,729,010

Montville Township Public Schools
Exhibit D
ECM 2A 500 & 600 Wing Airedale Replacements
Airdale Replacements
MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption (kWh)	Proposed Condensing Unit Consumption (kWh)	Savings (kWh)
COOLING														
100 to 105	102.5	-	1	-	1	1	-	4.0	4.0	4	-	5	3	2
95 to 100	97.5	-	19	2	21	21	1	4.0	4.0	82	2	112	63	49
90 to 95	92.5	-	44	13	57	54	3	4.0	4.0	215	13	304	170	134
85 to 90	87.5	1	167	60	228	212	16	2.8	2.8	588	44	842	471	371
80 to 85	82.5	31	283	162	476	412	64	2.2	2.2	888	137	1,367	764	603
75 to 80	77.5	191	235	280	706	493	213	1.5	-	758	-	1,011	565	446
70 to 75	72.5	203	177	222	602	394	208	0.9	-	364	-	485	271	214
65 to 70	67.5	325	165	204	694	399	295	0.3	-	123	-	164	92	72
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	-	-	-
Total		931	1,242	1,138	3,311	2,328	983	15.7	12.9	3,018	196	4,285	2,395	1,892

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Mixed Air Temp	Temp rise across coil	Heat Load on the unit	Load % at bin O/A temp (Note 1)	Heat provided by unit
HEATING								°F	°F	btu/hr	%	Btu/Yr
55 to 60	57.5	86	144	97	327	238	89	63.9	21.1	36,504	73.8%	6,418,368
50 to 55	52.5	109	182	172	463	338	125	63.1	21.9	37,800	76.4%	9,770,846
45 to 50	47.5	105	119	142	366	252	114	62.4	22.6	39,096	79.0%	7,779,378
40 to 45	42.5	185	155	177	517	334	183	61.6	23.4	40,392	81.7%	11,016,609
35 to 40	37.5	236	200	241	677	440	237	60.9	24.1	41,688	84.3%	15,450,365
30 to 35	32.5	237	202	198	637	410	227	60.1	24.9	42,984	86.9%	15,305,354
25 to 30	27.5	121	115	113	349	230	119	59.4	25.6	44,280	89.5%	9,117,039
20 to 25	22.5	149	68	97	314	178	136	58.6	26.4	45,576	92.1%	7,474,862
15 to 20	17.5	95	40	46	181	98	83	57.9	27.1	46,872	94.8%	4,363,855
10 to 15	12.5	39	9	28	76	40	36	57.1	27.9	48,168	97.4%	1,864,512
5 to 10	7.5	21	5	5	31	14	17	56.4	28.6	49,464	100.0%	692,496
0 to 5	2.5	4	2	-	6	3	3	55.6	29.4	50,760	100.0%	152,280
-5 to 0	-2.5	4	-	-	4	1	3	54.9	30.1	52,056	100.0%	52,056
-10 to -5	-7.5	-	-	-	-	-	-	54.1	30.9	53,352	100.0%	-
-15 to -10	-12.5	-	-	-	-	-	-	53.4	31.6	54,648	100.0%	-
Total		1,391	1,241	1,316	3,948	2,576	1,372					89,458,020

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Montville Township Public Schools
Exhibit D
UV Replacement Spreadsheet

*Inputs are blue
*Automatic Mechanical List pull-in colored purple

EXISTING															
Building	Equipment Label	Qty	Location	Replace (Y/N)	DCV (Y/N)	Direct Fired	Thermal Fuel	Manufacturer	Model No.	Area Served	Tonnage	Supply CFM	Fresh Air CFM	Existing EER	Existing Thermal Efficiency
Montville High School	MHS-UV-1-6	6	500/600 Wing	Y	N	N	Natural Gas	Airedale	CMX-4	RM-500,501,502,503,504,511	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-7-11	5	500/600 Wing	Y	N	N	Natural Gas	Airedale	CMX-2	RM 513,514,518,615,618	2.0	800	120	9.0	80%
Montville High School	MHS-UV-12-21	10	500/600 Wing	Y	N	N	Natural Gas	Airedale	CM5X	509,600,602,603,604,607,610,611,612	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-1	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-4	RM 500	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-2	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-4	RM 501	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-3	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-4	RM 502	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-4	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-4	RM 503	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-5	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-4	RM 504	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-6	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-2	RM 518	2.0	800	120	9.0	80%
Montville High School	MHS-UV-7	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-2	RM 514	2.0	800	120	9.0	80%
Montville High School	MHS-UV-8	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-2	RM 513	2.0	800	120	9.0	80%
Montville High School	MHS-UV-9	1	500 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 509	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-10	1	500 Wing	N	N	N	Natural Gas	Airedale	CMX-4	RM 511	3.0	1,200	180	9.0	80%
Montville High School	MHS-UV-11	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 607	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-12	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 604	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-13	1	600 Wing	N	N	N	Natural Gas	Airedale	CMX-2	RM 618	2.0	800	120	9.0	80%
Montville High School	MHS-UV-14	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 603	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-15	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 602	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-16	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 603	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-17	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 614	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-18	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 612	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-19	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 611	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-20	1	600 Wing	N	N	N	Natural Gas	Airedale	CMX-2	RM 615	2.0	800	120	9.0	80%
Montville High School	MHS-UV-21	1	600 Wing	N	N	N	Natural Gas	Airedale	CM5X	RM 610	4.0	1,600	240	9.0	80%
Montville High School	MHS-UV-41-79	39	Original Section	N	N	N	-	Nesbitt	-	Original Section	-	-	-	-	80%
Lazar Middle School	LMS-UV-1-34	34	Original Section	N	N	N	-	Nesbitt	-	Original Section	-	-	-	-	80%
Lazar Middle School	LMS-UV-35-57	23	New Section	N	N	N	-	TRANE	VUVB15011	new section	3.5		-	10.0	80%
Valley View Elementary School	VVES-UV-1-22	22	Original Section	N	N	N	-	AAF Herman Nelson	-	Original Section	-		-	-	80%
Valley View Elementary School	VVES-UV-23-25	3	New Section	N	N	N	-	TRANE	-	new section	3.5		-	10.0	80%
Woodmont Elementary School	WES-UV-1-13	13	Original Section	N	N	N	-	Nesbitt	-	Original Section	-		-	-	80%
Woodmont Elementary School	WES-UV-14-16	3	New Section	N	N	N	-	TRANE	-	new section	3.5		-	10.0	80%
Hilldale Elementary School	HES-UV-1-14	14	Original Section	N	N	N	-	TRANE	FSSN10H1	-	-		-	-	80%
Hilldale Elementary School	HES-UV-15-24	10	New Section	N	N	N	-	TRANE	-	-	3.5		-	10.0	80%
Totals		203									91				

PROPOSED							
Qty	Thermal Fuel	Direct Fired	Manufacturer	Model No.	Tonnage	Proposed EER	Proposed Thermal Efficiency
6	Natural Gas	N	Modine	CMD36	3.0	14.4	82.0%
5	Natural Gas	N	Modine	CMD24	2.0	14.1	82.0%
10	Natural Gas	N	Modine	CMD36	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD36	3.0	14.4	82.0%
1	Natural Gas	N	Modine	CMD36	3.0	14.4	82.0%
1	Natural Gas	N	Modine	CMD36	3.0	14.4	82.0%
1	Natural Gas	N	Modine	CMD36	3.0	14.4	82.0%
1	Natural Gas	N	Modine	CMD24	2.0	14.1	82.0%
1	Natural Gas	N	Modine	CMD24	2.0	14.1	82.0%
1	Natural Gas	N	Modine	CMD24	2.0	14.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD36	3.0	14.4	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD24	2.0	14.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
1	Natural Gas	N	Modine	CMD24	2.0	14.1	82.0%
1	Natural Gas	N	Modine	CMD48	4.0	16.1	82.0%
42					77.0		

EXISTING UV SPECIFICATIONS

Building	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School
Label	MHS-UV-1-6	MHS-UV-7-11	MHS-UV-12-21	MHS-UV-1	MHS-UV-2	MHS-UV-3	MHS-UV-4	MHS-UV-5	MHS-UV-6	MHS-UV-7	MHS-UV-8	MHS-UV-9	MHS-UV-10	MHS-UV-11	MHS-UV-12	MHS-UV-13	MHS-UV-14	MHS-UV-15	MHS-UV-16	MHS-UV-17	MHS-UV-18	MHS-UV-19	MHS-UV-20	MHS-UV-21
Quantity	6	5	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Area Serving	RM-500,501,502,503,504,511	RM 513,514,518,615,618	RM 509,600,602,603,604,607,610,611,612,614	RM 500	RM 501	RM 502	RM 503	RM 504	RM 518	RM 514	RM 513	RM 509	RM 511	RM 607	RM 604	RM 618	RM 603	RM 602	RM 603	RM 614	RM 612	RM 611	RM 615	RM 610
Tonnage	3.0	2.0	4.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	4.0	3.0	4.0	4.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	4.0
Supply CFM	1,200	800	1,600	1,200	1,200	1,200	1,200	1,200	800	800	800	1,600	1,200	1,600	1,600	800	1,600	1,600	1,600	1,600	1,600	1,600	800	1,600
Fresh Air CFM	180	120	240	180	180	180	180	180	120	120	120	240	180	240	240	120	240	240	240	240	240	240	120	240
Existing EER	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Direct Fired	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Thermal Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Existing Thermal Efficiency	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%

Montville Township Public Schools
Exhibit D
ECM 2B 500 & 600 Wing VRV Install/Airedale Refurbishment
DX Cooling Replacement

ECM DESCRIPTION

Replace existing low efficiency window units in respective buildings with new high efficiency window units with an EER of 12+

DATA / ASSUMPTIONS

*Run Hours based on occupancy schedule
*Full Load is estimated at (unless stated otherwise) : 95 °F
*Run hours are based on chiller cutoff temperature and bin weather data

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and installed chillers and operating hours. All existing chillers will be measured before removal and new motors after the installation.

COMMISSIONING

Start up equipment ensure proper operation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

The safety factor for this ECM is taken at 0 due to some variances on the run hours and the estimated part load efficiencies of the existing chiller.

FORMULAE

OPTIMIZATION

$W_{SAVINGS} = W_C \cdot \eta_{\%}$

REPLACEMENT

$W_{SAVINGS} = W_C - W_C$

$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$
$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC}$ = Building Label DHW Quantity
- -
- -

Variable	Units	-	-
$W_{SAVINGS}$	kWh	-	-
W_C	kWh	-	-
W_C	kWh	-	-
$\eta_{\%}$	%	Efficiency gain due to condensing unit optimization	
$\sum_{60}^{105}$	-	Summation of all bins from 60°F to 105°F	
C	Ton	Tonnage of condensing unit	
η	-	Existing efficiency of condensing unit (EER)	
η	-	Proposed efficiency of condensing unit (EER)	
T_{DESIGN}	°F	Design Temperature of condensing unit (Usually 97.5°F)	
T_{BIN}	°F	Bin Weather Temperature	
T_{OCC}	°F	Temperature of building during occupied hours	
T_{UNOCC}	°F	Temperature of building during unoccupied hours	
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin	
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin	

Montville Township Public Schools
Exhibit D
ECM 2B 500 & 600 Wing VRV Install/Airedale Refurbishment
DX Cooling Replacement

* Inputs are in blue
*Checks against baseline are in purple

Building	Label	Qty	Tonnage (Each)	Current EER	Proposed EER	Area Serving
Montville High School	MHS-UV-1-6	DHW Quantity	0.0	0.0	19.4	1-500,501,502,503,504,511
Montville High School	MHS-UV-7-11	5	2.0	9.0	19.4	RM 513,514,518,615,618
Montville High School	MHS-UV-12-21	10	4.0	9.0	19.4	0,602,603,604,607,610,611,612,614
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
Totals			**6.0**			

CALCULATIONS

	Montville High School	Montville High School	Montville High School
Label	MHS-UV-1-6	MHS-UV-7-11	MHS-UV-12-21
Qty	DHW Quantity	5.00	10.00
Area Serving	1-500,501,502,503,504,5	RM 513,514,518,615,618	0,602,603,604,607,610,6
Condensing Unit Tonnage	-	2.0	4.0
Current EER	-	9.0	9.0
Proposed EER	19.4	19.4	19.4
Existing Occupied Cooling Setpoint	70.0	70.0	70.0
Existing Unoccupied Cooling Setpoint	65.0	65.0	65.0
Current Condensing Unit Consumption	#DIV/0!	2,225	4,450
Percent of Baseline Consumption	#DIV/0!	0.1%	0.2%
Proposed Condensing Unit Consumption	-	1,032	2,064
Safety Factor	0%	0%	5%
Electrical Savings	#DIV/0!	5,971	22,688

MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	1	-	1	1	-	-	-	-	-	#DIV/0!	-	#DIV/0!
95 to 100	97.5	-	19	2	21	21	1	-	-	-	-	#DIV/0!	-	#DIV/0!
90 to 95	92.5	-	44	13	57	54	3	-	-	-	-	#DIV/0!	-	#DIV/0!
85 to 90	87.5	1	167	60	228	212	16	-	-	-	-	#DIV/0!	-	#DIV/0!
80 to 85	82.5	31	283	162	476	412	64	-	-	-	-	#DIV/0!	-	#DIV/0!
75 to 80	77.5	191	235	280	706	493	213	-	-	-	-	#DIV/0!	-	#DIV/0!
70 to 75	72.5	203	177	222	602	394	208	-	-	-	-	#DIV/0!	-	#DIV/0!
65 to 70	67.5	325	165	204	694	399	295	-	-	-	-	#DIV/0!	-	#DIV/0!
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	#DIV/0!	-	#DIV/0!
Total		931	1,242	1,138	3,311	2,328	983	-	-	-	-	#DIV/0!	-	#DIV/0!

MONTVILLE HIGH SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	1	-	1	1	-	2.0	2.0	2	-	3	1	1
95 to 100	97.5	-	19	2	21	21	1	2.0	2.0	41	1	56	26	30
90 to 95	92.5	-	44	13	57	54	3	2.0	2.0	108	7	152	71	81
85 to 90	87.5	1	167	60	228	212	16	1.4	1.5	297	24	428	198	229
80 to 85	82.5	31	283	162	476	412	64	1.0	1.2	412	74	649	301	348
75 to 80	77.5	191	235	280	706	493	213	0.6	0.8	296	178	631	293	338
70 to 75	72.5	203	177	222	602	394	208	0.2	0.5	79	104	244	113	131
65 to 70	67.5	325	165	204	694	399	295	-	0.2	-	49	66	30	35
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	-	-	-
Total		931	1,242	1,138	3,311	2,328	983	7.2	8.2	1,232	436	2,225	1,032	1,194

Montville Township Public Schools
Exhibit D
DX Unit Replacement Spreadsheet

EXISTING								PROPOSED			
Building	Equipment Label	Qty	Replace (Y/N)	Manufacturer	Area Served	Tonnage (Each)	Existing EER	Manufacturer	Qty	Total Tonnage	Proposed IMPLV
Montville High School	MHS-UV-1-6	6	Y	Airedale	500,501,502,503,504,	3.0	9.0	Daikin	6	18.0	19.4
Montville High School	MHS-UV-7-11	5	y	Airedale	M 513,514,518,615,61	2.0	9.0	Daikin	5	25.0	19.4
Montville High School	MHS-UV-12-21	10	Y	Airedale	602,603,604,607,610,	4.0	9.0	Daikin	10	40.0	19.4
Montville High School	MHS-UV-1	1	N	Airedale	RM 500	3.0	9.0				
Montville High School	MHS-UV-2	1	N	Airedale	RM 501	3.0	9.0				
Montville High School	MHS-UV-3	1	N	Airedale	RM 502	3.0	9.0				
Montville High School	MHS-UV-4	1	N	Airedale	RM 503	3.0	9.0				
Montville High School	MHS-UV-5	1	N	Airedale	RM 504	3.0	9.0				
Montville High School	MHS-UV-6	1	N	Airedale	RM 518	2.0	9.0				
Montville High School	MHS-UV-7	1	N	Airedale	RM 514	2.0	9.0				
Montville High School	MHS-UV-8	1	N	Airedale	RM 513	2.0	9.0				
Montville High School	MHS-UV-9	1	N	Airedale	RM 509	4.0	9.0				
Montville High School	MHS-UV-10	1	N	Airedale	RM 511	3.0	9.0				
Montville High School	MHS-UV-11	1	N	Airedale	RM 607	4.0	9.0				
Montville High School	MHS-UV-12	1	N	Airedale	RM 604	4.0	9.0				
Montville High School	MHS-UV-13	1	N	Airedale	RM 618	2.0	9.0				
Montville High School	MHS-UV-14	1	N	Airedale	RM 603	4.0	9.0				
Montville High School	MHS-UV-15	1	N	Airedale	RM 602	4.0	9.0				
Montville High School	MHS-UV-16	1	N	Airedale	RM 603	4.0	9.0				
Totals		37				59.0			21	83.0	

2.5
3

EXISTING WINDOW UNIT SPECIFICATIONS

	Building	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School
	Label	MHS-UV-1-6	MHS-UV-7-11	MHS-UV-12-21	MHS-UV-1	MHS-UV-2	MHS-UV-3	MHS-UV-4	MHS-UV-5	MHS-UV-6	MHS-UV-7	MHS-UV-8	MHS-UV-9	MHS-UV-10	MHS-UV-11	MHS-UV-12	MHS-UV-13	MHS-UV-14	MHS-UV-15	MHS-UV-16	MHS-UV-17	MHS-UV-18	MHS-UV-19	MHS-UV-20	MHS-UV-21
	Area Serving	RM-500,501,502,503,504,511	RM 513,514,518,615,618	RM 509,600,602,603,604,607,610,611,612,614	RM 500	RM 501	RM 502	RM 503	RM 504	RM 518	RM 514	RM 513	RM 509	RM 511	RM 607	RM 604	RM 618	RM 603	RM 602	RM 603	RM 614	RM 612	RM 611	RM 615	RM 610
Building	Label	DHW Quantity	5	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	0	0.0	2.0	4.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	4.0	3.0	4.0	4.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	4.0
	0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	0	0																							
PROPOSED WINDOW UNIT SPECIF	0	0																							
	0	0																							

0	**0**	**Montville High School**	**Montville High School**
CU Replacement	Y	y	Y
Label	MHS-UV-1-6	MHS-UV-7-11	MHS-UV-12-21
Area Serving	RM-500,501,502,503,504,511	RM 513,514,518,615,618	RM 509,600,602,603,604,607,610,611,612,614
Quantity	6	5	10
Tonnage	18.0	25.0	40.0
Proposed EER	19.4	19.4	19.4

Montville Township Public Schools
Exhibit D
RTU Replacement Spreadsheet

*Inputs are blue
*Automatic Mechanical List pull-in colored purple

EXISTING												PROPOSED					
Building	Equipment Label	Qty	Location	Replace (Y/N)	DCV (Y/N)	Direct Fired	Thermal Fuel	Manufacturer	Model No.	Area Served	Tonnage	Supply CFM	Fresh Air CFM	Existing IEER	Existing Thermal Efficiency	Qty	Thermal Fuel	Direct Fired	Manufacturer	Model No.	Tonnage	Proposed IEER	Proposed Thermal Efficiency
Valley View Elementary School	VVES-AC-1	1	Roof	Y	N	N	-	Seasons4	4HE20-0241-HW3.6-05	second floor core cla	20.0	8,000	1,200	12.8	0%	1	None	N	Daikin	RCS-020	20.0	20.0	
Valley View Elementary School	VVES-AC-2	1	Roof	Y	N	N	-	Seasons4	4HE20-0241-HW3.6-05	second floor core cla	20.0	8,000	1,200	12.8	0%	1	None	N	Daikin	RCS-020	20.0	20.0	
Lazar Middle School	LMS-RTU-7A	1	Roof	N	N	N	-	TRANE	7C4B D1001ABDE0G0	Gym	25.0	10,000	1,500	9.0	0%	1	None	N	Daikin	RCS-025	24.0	20.0	
Lazar Middle School	LMS-RTU-7B	1	Roof	N	N	N	-	TRANE	7C4B D1001ABDE0G0	Gym	25.0	10,000	1,500	9.0	0%	1	None	N	Daikin	RCS-025	24.0	20.0	
Woodmont Elementary School	WES-RTU-6	1	Roof	N	N	N	-	Carrier	50CD006S00	Room 23	5.0	2,000	300	7.9	0%	1	None	N	Lennox	LGH094U4E/M	7.5	20.7	
Woodmont Elementary School	WES-RTU-7	1	Roof	N	N	N	-	Carrier	50CD006S00	Room 22	5.0	2,000	300	7.9	0%	1	None	N	Lennox	LGH094U4E/M	7.5	20.7	
Woodmont Elementary School	WES-RTU-5	1	Roof	N	N	N	-	Carrier	50CD008S00	Room 20	7.5	3,000	450	7.9	0%	1	None	N	Lennox	LGH094U4E/M	7.5	20.7	
Montville High School	MHS-RTU-13	1	Roof	N	N	N	-	TRANE	TCD103B40ADA	Chorus	8.5	3,400	510	12.0	0%								
Montville High School	MHS-RTU-36	1	Roof	N	N	N	-	TRANE	TCD103B40ADA	Band Room	8.5	3,400	510	12.0	0%								
Cedar Hill Elementary School	CH-RTU-1	1	Roof	N	N	Y	Natural Gas	Carrier	48SS-D2406331AA	Rm 22,23	2.0	800	120	9.0	80%								
Cedar Hill Elementary School	CH-RTU-3	1	Roof	N	N	Y	-	TRANE	TCD181C30AA	Cafeteria	15.0	6,000	900	9.0	0%								
Cedar Hill Elementary School	CH-RTU-2	1	Roof	N	N	Y	Natural Gas	Carrier	48SS-D3608321AA	Media Center	3.0	1,200	180	9.0	80%								
Hilldale Elementary School	HES-RTU-1	1	Roof	N	N	N	-	TRANE	THC072A3RDA1VG0 C	Main ofice	6.0	2,400	360	11.5	0%								
Lazar Middle School	LMS-RTU-1	1	Roof	N	N	N	-	TRANE	TCD211C30AAB	Unknown	18.0	7,200	1,080	11.0	0%								
Lazar Middle School	LMS-RTU-2	1	Roof	N	N	N	-	TRANE	TCD049C30CBD	Unknown	4.0	1,600	240	9.8	0%								
Lazar Middle School	LMS-RTU-3	1	Roof	N	N	N	-	TRANE	TCD181C30CAA	Unknown	15.0	6,000	900	9.9	0%								
Lazar Middle School	LMS-RTU-4	1	Roof	N	N	N	-	TRANE	TC0091030CBC	Unknown	7.5	3,000	450	9.7	0%								
Lazar Middle School	LMS-RTU-5	1	Roof	N	N	N	-	TRANE	TCD121C30AAA	Unknown	10.0	4,000	600	9.7	0%								
Lazar Middle School	LMS-RTU-6	1	Roof	N	N	N	-	TRANE	TCD151C30AAA	Unknown	12.5	5,000	750	9.8	0%								
Montville High School	MHS-RTU-25	1	Roof	N	N	N	-	Carrier	50TFF008	Room 409	7.5	3,000	450	9.8	0%								
Montville High School	MHS-RTU-38	1	Roof	N	N	N	-	Carrier	50TM-003	Rm 408	3.0	1,200	180	9.8	0%								
Montville High School	MHS-RTU-29	1	Roof	N	N	N	-	Carrier	50TM-008-A-601	Rooms 419/420/442	7.5	3,000	450	9.8	0%								
Montville High School	MHS-RTU-22	1	Roof	N	N	N	-	Lennox	LCA036HN1G	Guidance Rooms	3.0	1,200	180	10.6	0%								
Montville High School	MHS-RTU-1	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Team Room	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-4	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Girls Coachs Office	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-5	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Phys Ed Office, Rm 10	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-6	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Room 101	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-7	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Weight Room	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-8	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Weight Room	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-9	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Room 103	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-31	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Room 507	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-32	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Room 615	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-33	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Room 505	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-34	1	Roof	N	N	N	-	Lennox	LCA048HN3G	Room 506	4.0	1,600	240	10.4	0%								
Montville High School	MHS-RTU-2	1	Roof	N	N	N	-	Lennox	LCA060HN1G	Hall (400)	5.0	2,000	300	10.3	0%								
Montville High School	MHS-RTU-3	1	Roof	N	N	N	-	Lennox	LCA060HN1G	Girls Coachs Office	5.0	2,000	300	10.3	0%								
Montville High School	MHS-RTU-14	1	Roof	N	N	N	-	Lennox	LCA090HN1G	Drawing Room	7.5	3,000	450	10.0	0%								
Montville High School	Building	Label	DHW Quantity	N	N	N	-	Lennox	LCA090HN1G	100 Wing hallway	7.5	3,000	450	10.0	0%								
Montville High School	MHS-RTU-16	-	-	N	N	N	-	Lennox	LCA090HN1G	Yearbrook Room	7.5	3,000	450	10.0	0%								
Montville High School	MHS-RTU-17	-	-	N	N	N	-	Lennox	LCA090HN1G	TV/Video Room	7.5	3,000	450	10.0	0%								
Montville High School	MHS-RTU-30	-	-	N	N	N	-	Lennox	LCA120HN1G	Hallways (600 Level)	10.0	4,000	600	9.7	0%								
Montville High School	MHS-RTU-35	-	-	N	N	N	-	Lennox	LCA120HN1G	Hallways (500 Level)	10.0	4,000	600	10.0	0%								
Montville High School	MHS-RTU-10	-	-	N	N	N	-	Lennox	LCA180HN1G	Wrestling Room	15.0	6,000	900	11.2	0%								
Montville High School	MHS-RTU-1B-21	-	-	N	N	N	-	Lennox	LCC156HN1G	Café	12.2	4,880	732	13.0	0%								
Montville High School	MHS-RTU-11,12	2	Roof	N	N	N	-	McQuay	RPS025CLW	Gym	25.0	10,000	1,500	10.8	0%								
Montville High School	MHS-RTU-37	1	Roof	N	N	N	-	York (Coleman)	DAPB-F036AB	100 Wing hallway	3.0	1,200	180	12.0	0%								
Montville High School	MHS-RTU-26	1	Roof	N	N	N	-	-	DHUC-T060N125A	Room 413	6.0	2,400	360	9.0	80%								
Valley View Elementary School	VVES-RTU-2	1	Roof	N	N	N	-	TRANE	TCD0181	All Purpose Room	15.0	6,000	900	9.9	0%								
Valley View Elementary School	VVES-RTU-1	1	Roof	N	N	N	-	York	H8H8-W120AE	First floor offices	10.0	4,000	600	9.6	0%								
Woodmont Elementary School	WES-RTU-1	1	Roof	N	N	N	-	Carrier	25-10C00NTAAA5	Rooms 14 & 16	10.0	4,000	600	8.7	0%								
Woodmont Elementary School	WES-RTU-3,4	2	Roof	N	N	N	-	Lennox		Rooms 18 & 24	50.0		-	2.0	80%								
Totals		46									489					7					110.5		

Fuel types: None, Electric, Natural Gas, Fuel Oil #2, Fuel Oil #4, Fuel Oil #6, Propane

EXISTING RTU SPECIFICATIONS

Building	Valley View Elementary School	Valley View Elementary School	Lazar Middle School	Lazar Middle School	Woodmont Elementary School	Woodmont Elementary School	Woodmont Elementary School	Montville High School	Montville High School	Cedar Hill Elementary School	Cedar Hill Elementary School	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School
Label	VVES-AC-1	VVES-AC-2	LMS-RTU-7A	LMS-RTU-7B	WES-RTU-6	WES-RTU-7	WES-RTU-5	MHS-RTU-13	MHS-RTU-36	CH-RTU-1	CH-RTU-3	CH-RTU-2	HES-RTU-1	LMS-RTU-1	LMS-RTU-2	LMS-RTU-3	LMS-RTU-4	LMS-RTU-5	LMS-RTU-6	MHS-RTU-25	MHS-RTU-38	MHS-RTU-29	MHS-RTU-22	MHS-RTU-1	MHS-RTU-4	MHS-RTU-5	MHS-RTU-6
Quantity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Area Serving	Library & second floor core classrooms	Library & second floor core classrooms	Gym	Gym	Room 23	Room 22	Room 20	Chorus	Band Room	Rm 22,23	Cafeteria	Media Center	Main ofice	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Room 409	Rm 408	Rooms 419/420/442	Guidance Rooms	Team Room	Girls Coachs Office	Phys Ed Office, Rm 100	Room 101
Tonnage	20.0	20.0	25.0	25.0	5.0	5.0	7.5	8.5	8.5	2.0	15.0	3.0	6.0	18.0	4.0	15.0	7.5	10.0	12.5	7.5	3.0	7.5	3.0	4.0	4.0	4.0	4.0
Supply CFM	8,000	8,000	10,000	10,000	2,000	2,000	3,000	3,400	3,400	800	6,000	1,200	2,400	7,200	1,600	6,000	3,000	4,000	5,000	3,000	1,200	3,000	1,200	1,600	1,600	1,600	1,600
Fresh Air CFM	1,200	1,200	1,500	1,500	300	300	450	510	510	120	900	180	360	1,080	240	900	450	600	750	450	180	450	180	240	240	240	240
Existing EER	12.8	12.8	9.0	9.0	7.9	7.9	7.9	12.0	12.0	9.0	9.0	9.0	11.5	11.0	9.8	9.9	9.7	9.7	9.8	9.8	9.8	9.8	10.6	10.4	10.4	10.4	10.4
Direct Fired	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Thermal Fuel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Natural Gas	0.0	Natural Gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Thermal Efficiency	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.0%	0.0%	80.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

MEASURED	ESTIMATED	MFG DATA	CALCULATED
X			

PROPOSED RTU SPECIFICATIONS

	Valley View Elementary School	Valley View Elementary School
RTU Replacement	Y	Y
Quantity	1	1
Area Serving	Library & second floor core classrooms	Library & second floor core classrooms
Tonnage (Replacement)	20.0	20.0
Thermal Fuel	None	None
Direct Fired	N	N
Proposed EER	20.0	20.0
Proposed Thermal Efficiency	0.0%	0.0%

MEASURED	ESTIMATED	MFG DATA	CALCULATED
X			

1 None N Lennox LGH094U4E/M 7.5 20.7

Montville Township Public Schools
Exhibit D
ECM 2C RTU Replacements
Rooftop Unit Replacement

ECM DESCRIPTION

Replace existing Rooftop Units with high efficiency units

DATA / ASSUMPTIONS

RTU Supply Air Temperature is assumed at, unless stated otherwise 85 °F
Full Load is estimated at 11°F for heating and 92.5°F for cooling unless stated otherwise

MEASUREMENT AND VERIFICATION

Option A (Electric) - Direct kW and savings measurements before and after installation conducted. A report is generated showing the reduction in kW
Option C (Fuel) - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify all functions of the rooftop system, safety and operation.

RECOVERY/SAFETY FACTOR

Safety Factor (Thermal) = 0%

A safety factor of 0 is used due to minimal variables and the proven results of this measure

FORMULAE

$W_{SAVINGS} = W_C - W_C$

$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$
$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$Q_{SAVINGS} = \sum_{-5}^{60} Q_{INPUT} - Q_{INPUT}$

$Q_{INPUT} = \sum^{6C}$ Building

$Q_{INPUT} = \sum_{-5}^{60} (t_{OCC} \cdot Q_{LOAD} \cdot L_{\%}) / \eta_{RTU}$

$Q_{LOAD} = \sum_{-5}^{60} 1.08 \cdot CFM_{SUPPLY} \cdot (T_{SUPPLY} - T_{MIXED})$

$T_{RISE} = \sum_{-5}^{60} T_{SUPPLY} - T_{MIXED}$

$T_{MIXED} = \sum_{-5}^{60} ((CFM_{RETURN} \cdot T_{RETURN}) + (CFM_{OA} \cdot T_{BIN})) / (CFM_{RETURN} + CFM_{OA})$

Label	DHW Quantity	
Existing Input heat pı	Proposed Input heat provided by RTUs at respective bin temperature	
	0	0
	0	0
	0	0
	0	0
	0	0

Montville Township Public Schools
Exhibit D
ECM 2C RTU Replacements
Rooftop Unit Replacement

Variable	Units	Description	
$W_{SAVINGS}$	kWh	Electrical Savings	
W_C	kWh	Existing RTU Consumption	
W_C	kWh	Proposed RTU Consumption	
$\eta_{\%}$	%	Efficiency gain due to RTU optimization	
$\sum_{60}^{105}$	-	Summation of all bins from 60°F to 105°F	
C	Ton	Tonnage of RTU	
η	-	Existing efficiency of RTU (EER)	
η	-	Proposed efficiency of RTU (EER)	
T_{DESIGN}	°F	Design Temperature of RTU (Usually 97.5°F)	
T_{BIN}	°F	Bin Weather Temperature	
T_{OCC}	°F	Temperature of building during occupied hours	
T_{UNOCC}	°F	Temperature of building during unoccupied hours	
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin	
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin	
$Q_{SAVINGS}$	Therms	Thermal Savings	
$\sum_{-5}^{60}$	-	Summation of all bins from -5°F to 60°F	
T_{BIN}	°F	Temperature of respective bin	
Q_{INPUT}	Therms	Existing Input heat provided by RTUs at respective bin temperature	
Q_{INPUT}	Therms	Proposed Input heat provided by RTUs at respective bin temperature	
Q_{LOAD}	Therms	Heat load on the unit vent	**45%**
$L_{\%}$	%	Load % at respective bin	
T_{RISE}	°F	Temperature rise across the coil (100% Design at 10°F)	
T_{MIXED}	°F	Mixed air temperature	
T_{SUPPLY}	Hrs	Temperature of supply air	
T_{RETURN}	Hrs	Temperature of return air	
CFM_{SUPPLY}	CFM	Total supply CFM of unit vent	
CFM_{OA}	CFM	Total outside air CFM of unit vent	
CFM_{RETURN}	CFM	Total return air CFM of unit vent	
q	-	Quantity of replaced/refurbished RTUs	
η_{REFURB}	**%**	Efficiency improvement of refurbished unit vent	
$\eta_{REPLACE}$	**%**	Efficiency improvement of replaced unit vent	
t_{OCC}	Hrs	Occupied Bin Hours in respective temperature bin	

* Inputs are in blue
*Checks against baseline are in purple

Building	Label	Thermal Fuel	Area Serving
Valley View Elementary School	VVES-AC-1	0	ry & second floor core classrooms
Valley View Elementary School	VVES-AC-2	0	ry & second floor core classrooms
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Montville Township Public Schools
Exhibit D
ECM 2C RTU Replacements
Rooftop Unit Replacement

CALCULATIONS

	Valley View Elementary School	Valley View Elementary School
Label	VVES-AC-1	VVES-AC-2
Fuel Switch	Y	Y
Existing Thermal Fuel	-	-
Proposed Thermal Fuel	None	None
Area Serving	& second floor core cla	& second floor core clas
Quantity	1	1
RTU Tonnage	20.0	20.0
RTU Supply Air CFM	8,000	8,000
RTU Fresh Air CFM	1,200	1,200
RTU Return Air CFM	6,800	6,800
Current Thermal Efficiency	0%	0%
Proposed Thermal Efficiency	0%	0%
Current EER	12.8	12.8
Proposed EER	20.0	20.0
Existing Occupied Heating Setpoint	70.0	70.0
Existing Unoccupied Heating Setpoint	65.0	65.0
Existing Occupied Cooling Setpoint	75.0	75.0
Existing Unoccupied Cooling Setpoint	80.0	80.0
Supply Air Temperature	85.0	85.0
Current RTU kWh Consumption	14,899	14,899
Current RTU Thermal Consumption	-	-
Percent of Electric Baseline Consumption	3.3%	3.3%
Percent of Thermal Baseline Consumption	0.0%	0.0%
Proposed RTU kWh Consumption	9,535	9,535
Proposed RTU Thermal Consumption	-	-
Safety Factor	0%	0%
Electrical Savings	5,364	5,364

VALLEY VIEW ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	1	-	1	1	-	20.0	20.0	20	-	19	12	7
95 to 100	97.5	-	19	2	21	21	1	20.0	20.0	410	10	394	252	142
90 to 95	92.5	-	44	13	57	54	3	16.9	16.9	910	55	904	579	326
85 to 90	87.5	1	167	60	228	212	16	13.8	13.8	2,939	218	2,960	1,894	1,065
80 to 85	82.5	31	283	162	476	412	64	10.8	10.8	4,440	687	4,806	3,076	1,730
75 to 80	77.5	191	235	280	706	493	213	7.7	-	3,790	-	3,553	2,274	1,279
70 to 75	72.5	203	177	222	602	394	208	4.6	-	1,820	-	1,706	1,092	614
65 to 70	67.5	325	165	204	694	399	295	1.5	-	614	-	576	369	207
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	-	-	-
Total		931	1,242	1,138	3,311	2,328	983	75.4	81.5	14,922	970	14,899	9,535	5,370

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Mixed Air Temp	Temp rise across coil	Heat Load on the unit	Load % at bin O/A temp (Note 1)	Heat provided by unit
HEATING								°F	°F	btu/hr	%	Btu/Yr
55 to 60	57.5	86	144	97	327	238	89	63.9	21.1	182,520	73.8%	32,091,838
50 to 55	52.5	109	182	172	463	338	125	63.1	21.9	189,000	76.4%	48,854,230
45 to 50	47.5	105	119	142	366	252	114	62.4	22.6	195,480	79.0%	38,896,892
40 to 45	42.5	185	155	177	517	334	183	61.6	23.4	201,960	81.7%	55,083,047
35 to 40	37.5	236	200	241	677	440	237	60.9	24.1	208,440	84.3%	77,251,823
30 to 35	32.5	237	202	198	637	410	227	60.1	24.9	214,920	86.9%	76,526,771
25 to 30	27.5	121	115	113	349	230	119	59.4	25.6	221,400	89.5%	45,585,197
20 to 25	22.5	149	68	97	314	178	136	58.6	26.4	227,880	92.1%	37,374,310
15 to 20	17.5	95	40	46	181	98	83	57.9	27.1	234,360	94.8%	21,819,274
10 to 15	12.5	39	9	28	76	40	36	57.1	27.9	240,840	97.4%	9,322,559
5 to 10	7.5	21	5	5	31	14	17	56.4	28.6	247,320	100.0%	3,462,480
0 to 5	2.5	4	2	-	6	3	3	55.6	29.4	253,800	100.0%	761,400
-5 to 0	-2.5	4	-	-	4	1	3	54.9	30.1	260,280	100.0%	260,280
-10 to -5	-7.5	-	-	-	-	-	-	54.1	30.9	266,760	100.0%	-
-15 to -10	-12.5	-	-	-	-	-	-	53.4	31.6	273,240	100.0%	-
Total		1,391	1,241	1,316	3,948	2,338	1,372					447,290,101

Montville Township Public Schools
Exhibit D
ECM 2C RTU Replacements
Rooftop Unit Replacement

VALLEY VIEW ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption (kWh)	Proposed Condensing Unit Consumption (kWh)	Savings (kWh)
COOLING														
100 to 105	102.5	-	1	-	1	1	-	20.0	20.0	20	-	19	12	7
95 to 100	97.5	-	19	2	21	21	1	20.0	20.0	410	10	394	252	142
90 to 95	92.5	-	44	13	57	54	3	16.9	16.9	910	55	904	579	326
85 to 90	87.5	1	167	60	228	212	16	13.8	13.8	2,939	218	2,960	1,894	1,065
80 to 85	82.5	31	283	162	476	412	64	10.8	10.8	4,440	687	4,806	3,076	1,730
75 to 80	77.5	191	235	280	706	493	213	7.7	-	3,790	-	3,553	2,274	1,279
70 to 75	72.5	203	177	222	602	394	208	4.6	-	1,820	-	1,706	1,092	614
65 to 70	67.5	325	165	204	694	399	295	1.5	-	614	-	576	369	207
60 to 65	62.5	180	152	195	527	343	184	-	-	-	-	-	-	-
Total		931	1,242	1,138	3,311	2,328	983	75.4	81.5	14,922	970	14,899	9,535	5,370

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Mixed Air Temp	Temp rise across coil	Heat Load on the unit	Load % at bin O/A temp (Note 1)	Heat provided by unit
HEATING								°F	°F	btu/hr	%	Btu/Yr
55 to 60	57.5	86	144	97	327	238	89	63.9	21.1	182,520	73.8%	32,091,838
50 to 55	52.5	109	182	172	463	338	125	63.1	21.9	189,000	76.4%	48,854,230
45 to 50	47.5	105	119	142	366	252	114	62.4	22.6	195,480	79.0%	38,896,892
40 to 45	42.5	185	155	177	517	334	183	61.6	23.4	201,960	81.7%	55,083,047
35 to 40	37.5	236	200	241	677	440	237	60.9	24.1	208,440	84.3%	77,251,823
30 to 35	32.5	237	202	198	637	410	227	60.1	24.9	214,920	86.9%	76,526,771
25 to 30	27.5	121	115	113	349	230	119	59.4	25.6	221,400	89.5%	45,585,197
20 to 25	22.5	149	68	97	314	178	136	58.6	26.4	227,880	92.1%	37,374,310
15 to 20	17.5	95	40	46	181	98	83	57.9	27.1	234,360	94.8%	21,819,274
10 to 15	12.5	39	9	28	76	40	36	57.1	27.9	240,840	97.4%	9,322,559
5 to 10	7.5	21	5	5	31	14	17	56.4	28.6	247,320	100.0%	3,462,480
0 to 5	2.5	4	2	-	6	3	3	55.6	29.4	253,800	100.0%	761,400
-5 to 0	-2.5	4	-	-	4	1	3	54.9	30.1	260,280	100.0%	260,280
-10 to -5	-7.5	-	-	-	-	-	-	54.1	30.9	266,760	100.0%	-
-15 to -10	-12.5	-	-	-	-	-	-	53.4	31.6	273,240	100.0%	-
Total		1,391	1,241	1,316	3,948	2,576	1,372					447,290,101

Montville Township Public Schools
Exhibit D
ECM 2D Motor and VFD Replacements
Variable Frequency Drives and Motor Replacements

ECM DESCRIPTION

There are standard efficiency motors and motors that need to be replaced due to poor condition throughout the district. These motors will be replaced with premium high efficiency motors to save electrical energy. In addition some new motors will be equipped with variable frequency drives (VFDs) for additional savings.

DATA / ASSUMPTIONS

Load Factor	50%

*VFD run speed percentages are based on typical VFD curves for hot water / chilled water loops
*Run hours are based on the audit, data logging, and through interviews with facility staff

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and installed motors and operating hours. All existing motors will be measured before removal and new motors after the installation. VFD kW will be measured through the load range and selected motors with VFDs will be monitored for the time period using kW loggers. Equipment operating hours are based on the audit, logging and operating personnel input.

COMMISSIONING

Review installation documents for alignments and vibrations. Start up equipment and measure vibration through the load range along with motor kW. Verify that VFDs are capable of operating in full design range upon the control signal demand.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%

The safety factor for this ECM is taken at 0 due to some unknown data such as actual existing motor kW loads and operation hours.

FORMULAE

VFD

$W_{SAVINGSVFD} = W_{PROPOSED} - W_{VFD}$

$W_{VFD} = \sum_{0}^{60} Hp \cdot Lf \cdot \eta \cdot f^{\wedge 2.8} \cdot t_f$

MOTOR

$W_{SAVINGS} = W_{EXISTING} - W_{PROPOSED}$

$W_{EXISTING} = Hp \cdot Lf \cdot \eta \cdot t$
$W_{PROPOSED} = Hp \cdot Lf \cdot \eta \cdot t$

Montville Township Public Schools
Exhibit D
ECM 2D Motor and VFD Replacements
Variable Frequency Drives and Motor Replacements

Variable	Units	Description
$W_{savingsVFD}$	Building	Label DHW Quantity
$W_{savings}$	kWh	WES-P-3,4 -
Hp	HP	SN CT117502K40; 88 GPM -
t	Hrs	2 -
t	Hrs	5 -
Lf	-	0.815 -
η	-	Y -
η	-	Proposed efficiency of motor
Σ_{0}^{60}	-	Summation of all frequences (0 Hz to 60 Hz)
f	-	Frequency of drive, as a percentage of full frequency (60 Hz)
t_f	Hrs	Percentage of time motor will run at a particular frequency
W_{VFD}	kWh	Electrical consumption with VFD
$W_{EXISTING}$	kWh	Existing electrical consumption of motor
$W_{PROPOSED}$	kWh	Proposed electrical consumption of motor

ASSUMPTIONS / INPUTS

* Inputs are in blue

Building	Equipment Label	Configuration	Qty	HP	Existing Efficiency	Replace Motor	Add VFD
	CH-P-3,4	Zone Pump	2	5.0	89.5%	Y	Y
Cedar Hill Elementary School	CH-P-1,2	Boiler Pump	2	1.5	84.0%	Y	N
Hilldale Elementary School	HES-P-1,2	Zone Pump	2	10.0	89.5%	Y	Y
Lazar Middle School	LMS-P-8,9	Boiler Pump; 48 GPM	2	7.5	88.5%	Y	Y
Montville High School	MHS-P-1,2	Boiler Pump	2	20.0	93.0%	Y	Y
Montville High School	MHS-P-7,8	Boiler Pump	2	20	91.0%	Y	Y
Montville High School	MHS-P-3,4	e Pump; 391 GPM @	2	15	93.0%	Y	Y
Montville High School	MHS-P-5,6	one Pump; SN 12006	2	5	82.5%	Y	Y
Valley View Elementary School	VVES-P-3,4	Boiler Pump	2	8	91.0%	Y	Y
Woodmont Elementary School	WES-P-3,4	17502K40; 88 GPM (	2	5	81.5%	Y	Y
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
Total							

CALCULATIONS (MOTOR)

		Cedar Hill Elementary School	**Hilldale Elementary School**	**Lazar Middle School**	**Montville High School**	**Montville High School**	**Montville High School**	**Montville High School**	**Valley View Elementary School**	**Woodmont Elementary School**
Equipment Label	CH-P-3,4	CH-P-1,2	HES-P-1,2	LMS-P-8,9	MHS-P-1,2	MHS-P-7,8	MHS-P-3,4	MHS-P-5,6	VVES-P-3,4	WES-P-3,4
Equipment Configuration	Zone Pump	Boiler Pump	Zone Pump	Boiler Pump; 48 GPM	Boiler Pump	Boiler Pump	e Pump; 391 GPM @	one Pump; SN 12006	Boiler Pump	17502K40; 88 GPM (
Replace Motor	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VFD to be Installed	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Qty	2	2	2	2	2	2	2	2	2	2
HP	5.0	1.5	10.0	7.5	20.0	20.0	15.0	5.0	7.5	5.0
Run Hours	3,948	3,948	3,948	3,948	3,948	3,948	3,948	3,948	3,948	3,948
Load Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Existing Motor Efficiency	0.895	0.840	0.895	0.885	0.930	0.910	0.930	0.825	0.910	0.815
Proposed Motor Efficiency	0.907	0.890	0.917	0.910	0.930	0.930	0.924	0.907	0.910	0.907
Existing kW	2.1	0.7	4.2	3.2	8.0	8.2	6.0	2.3	3.1	2.3
Proposed kW	2.1	0.6	4.1	3.1	8.0	8.0	6.1	2.1	3.1	2.1
Existing Motor kWh Consumption	8,227	2,630	16,454	12,480	31,669	32,365	23,752	8,925	12,137	9,034
Proposed Motor kWh Consumption	8,118	2,482	16,059	12,137	31,669	31,669	23,906	8,118	12,137	8,118
Proposed Motor kWh Consumption w/ VFD	1,910	0	3,777	2,855	7,449	7,449	5,623	1,910	2,855	1,910
Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
kW Savings	0.0	0.0	0.1	0.1	0.0	0.2	(0.0)	0.2	0.0	0.2
kWh Savings	6,317	148	12,676	9,625	24,220	24,916	18,129	7,015	9,282	7,125

Montville Township Public Schools
Exhibit D
ECM 2D Motor and VFD Replacements
Variable Frequency Drives and Motor Replacements

MOTOR RUN PERCENTAGES AT RESPECTIVE SPEED

30%	0	0	0	0	0	0	0	0	0	0
40%	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
50%	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
60%	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
70%	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
80%	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
90%	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
100%	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95

KWH CONSUMPTION W/ VFD

30%	0	0	0	0	0	0	0	0	0	0
40%	83	25	164	124	324	324	245	83	124	83
50%	233	71	462	349	910	910	687	233	349	233
60%	403	123	798	603	1,573	1,573	1,188	403	603	403
70%	557	170	1,102	833	2,172	2,172	1,640	557	833	557
80%	374	114	740	559	1,459	1,459	1,102	374	559	374
90%	178	54	351	265	693	693	523	178	265	178
100%	81	25	161	121	317	317	239	81	121	81

30%	0.06	0.02	0.11	0.08	0.22	0.22	0.16	0.06	0.08	0.06
40%	0.13	0.04	0.26	0.20	0.51	0.51	0.39	0.13	0.20	0.13
50%	0.26	0.08	0.51	0.38	1.00	1.00	0.76	0.26	0.38	0.26
60%	0.44	0.14	0.88	0.66	1.73	1.73	1.31	0.44	0.66	0.44
70%	0.71	0.22	1.40	1.05	2.75	2.75	2.08	0.71	1.05	0.71
80%	1.05	0.32	2.08	1.57	4.11	4.11	3.10	1.05	1.57	1.05
90%	1.50	0.46	2.97	2.24	5.85	5.85	4.41	1.50	2.24	1.50
100%	2.06	0.63	4.07	3.07	8.02	8.02	6.06	2.06	3.07	2.06

Motor Cost	$ 8,143	$ 8,143	$ 9,732	$ 8,937	$ 12,908	$ 12,908	$ 11,320	$ 8,143	$ 8,937	$ 8,143
VFD Cost	$ 13,866	$ -	$ 16,570	$ 15,218	$ 21,979	$ 21,979	$ 19,274	$ 13,866	$ 15,218	$ 13,866

Montville Township Public Schools
Exhibit D
ECM 2E Split System Replacements
Condensing Unit Replacement

ECM DESCRIPTION

Replace existing low efficiency condensing units in respective buildings with new high efficiency condensing units.

CLARIFICATIONS, DELETIONS

*Run Hours based on occupancy schedule
*Full Load is estimated at (unless stated otherwise) : 97.5 °F
*Run hours are based on chiller cutoff temperature and bin weather data

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and installed condensing unit and operating hours.

COMMISSIONING

Start up equipment ensure proper operation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

The safety factor for this ECM is taken at 0 due to some variances on the run hours and the estimated part load efficiencies of the existing chiller.

FORMULAE

OPTIMIZATION

$W_{SAVINGS} = W_C \cdot \eta_{\%}$

REPLACEMENT

$W_{SAVINGS} = W_C - W_C$

$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$
$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$

$W_{C\text{-}UNOCC}$ = Building	Label	DHW Quantity
	-	-
	-	-

Montville Township Public Schools
Exhibit D
ECM 2E Split System Replacements
Condensing Unit Replacement

Variable	Units	-	-
$W_{SAVINGS}$	kWh	-	-
W_C	kWh	-	-
W_C	kWh	0	**0**
$\eta_{\%}$	%	Efficiency gain due to condensing unit optimization	
$\sum_{60}^{105}$	-	Summation of all bins from 60°F to 105°F	
C	Ton	Tonnage of condensing unit	
η	-	Existing efficiency of condensing unit (EER)	
η	-	Proposed efficiency of condensing unit (EER)	
T_{DESIGN}	°F	Design Temperature of condensing unit (Usually 97.5°F)	
T_{BIN}	°F	Bin Weather Temperature	
T_{OCC}	°F	Temperature of building during occupied hours	
T_{UNOCC}	°F	Temperature of building during unoccupied hours	
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin	
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin	

* Inputs are in blue
*Checks against baseline are in purple

Building	Label	Tonnage	Current EER	Proposed EER	Area Serving
Montville High School	MHS-CU-1	40.0	10.5	11.8	Auditorium
Montville High School	MHS-CU-2	28.0	10.7	12.1	Auditorium
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Totals		**68.0**			

CALCULATIONS

	Montville High School	Montville High School		
Label	MHS-CU-1	MHS-CU-2		
Area Serving	Auditorium	Auditorium		
Condensing Unit Tonnage	40.0	28.0		
Current EER	10.5	10.7		
Proposed EER	11.8	12.1		
Existing Occupied Cooling Setpoint	75.0	75.0		
Existing Unoccupied Cooling Setpoint	80.0	80.0		
Current Condensing Unit Consumption	18,466	12,684		
Percent of Baseline Consumption	**0.8%**	**0.6%**		
Proposed Condensing Unit Consumption	16,431	11,254		
Safety Factor	**0%**	**0%**	**0%**	**0%**
Electrical Savings	2,039	1,434		

Montville Township Public Schools
Exhibit D
Domestic Hot Water Spreadsheet

*Inputs are blue
*Automatic Mechanical List pull-in colored purple
**If Domestic Hot Water is fed off boiler put "Y" in Column F and put the respective boiler equipment label in Column C

EXISTING												
Building	Equipment Label	Qty	Location	Fed off Boiler (Y/N)	Replace DHW (Y/N)	Fuel	Manufacturer	Model No.	Capacity (MBH)	Capacity (Gal)	Combustion Efficiency	Percentage of Building DHW Load
Montville High School	MHS-DHW-1	2	Original Boiler Room	N	Y	Natural Gas	Lochinvar	PFN1002PM	1,000	600	0.86	100%
Lazar Middle School	LMS-DHW-1,2	2	Kitchen Storage Area	N	N	Natural Gas	Rheem	G65-360A	360	65	0.76	20%
Hilldale Elementary School	HES-DHW-2	1	Boiler Room	N	N	Electric	Perfomance	XE50M06ST4500	89	89	1.00	40%
Lazar Middle School	LMS-DHW-3	1	Original Boiler Room	N	N	Natural Gas	AO Smith	BTH 150A 200	150	200	0.90	80%
Valley View Elementary School	VVES-DHW-1	1	Boiler Room	N	N	Natural Gas	AO Smith	BTH 199A 200	200	200	0.81	100%
Woodmont Elementary School	WES-DHW-1	1	Boiler Room	N	N	Natural Gas	Rheem	PRO + G48-60N RH60	60	48	0.80	80%
Woodmont Elementary School	WES-DHW-2	1	Boiler Room	N	N	Electric	Vanguard	3WA71	15	50	1.00	20%
Totals		9							1,874			

PROPOSED						
Qty	Fuel	Manufacturer	Model No.	Capacity (MBH)	Capacity (Gal)	Combustion Efficiency
2	Natural Gas	Lochinvar	AWN801	800	200	96.0%
1	Natural Gas	AO Smith	BTH-299	300	100	95.0%
3				1,100		

EXISTING DHW EFFICIENCY

Building	Montville High School	Lazar Middle School	Hilldale Elementary School	Lazar Middle School	Valley View Elementary School	Woodmont Elementary School	Woodmont Elementary School	Hilldale Elementary School	William Mason Elementary School	Cedar Hill Elementary School
Label	MHS-DHW-1	LMS-DHW-1,2	HES-DHW-2	LMS-DHW-3	VVES-DHW-1	WES-DHW-1	WES-DHW-2	HES-DHW-1	WM-DHW-1	CH-DHW-1
Quantity	2	2	1	1	1	1	1	1	1	1
Location	Original Boiler Room	Kitchen Storage Area	Boiler Room	Original Boiler Room	Boiler Room	Boiler Room	Boiler Room	Addition janitor rm	Boiler Room	Boiler Room
Fuel Type	Natural Gas	Natural Gas	Electric	Natural Gas	Natural Gas	Natural Gas	Electric	Electric	Natural Gas	Natural Gas
Capacity (MBTU)	1,000	360	89	150	200	60	15	19	40	0
Percentage of Building Load	100%	20%	40%	80%	100%	80%	20%	60%	100%	0%
Current Efficiency	86.0%	76.0%	100.0%	90.0%	81.0%	80.0%	100.0%	100.0%	80.0%	0.0%

45%

PROPOSED DHW EFFICIENCY

	Montville High School
Isolate Storage Tank	N
Label	MHS-DHW-1
Fuel Type	Natural Gas
Quantity	2
Location	Original Boiler Room
Capacity (MBTU)	800.0
Proposed Efficiency	96.0%

Montville Township Public Schools
Exhibit D
ECM 2F DHW Replacement
Domestic Hot Water Upgrades

ECM DESCRIPTION

Replacement of Domestic Hot Water Heaters with high efficiency condensing Domestic Hot Water Heaters

DATA / ASSUMPTIONS

*Isolating a storage tank improves the DHW system efficiency by:	**3.0%**
Current DHW Heater Efficiency	**Varies**

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify all functions of the boiler control system, safety and operation. Verify air/fuel ratio is consistent through firing range. Provide training of the boiler operators

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	**0.0%**
Safety Factor (Thermal) =	**0.0%**

No Safety Factor is used because of a minimal of variables

DHW REPLACEMENT CALCULATION

$Q_{savings} = ((\eta_{NEW} - \eta_{OLD}) / \eta_{NEW}) \cdot Fuel_{DHW}$

Variable	Units	Description
$Q_{Savings}$	Therms	Thermal Savings
η_{NEW}	**%**	Efficiency of Existing DHW Heater
η_{OLD}	**%**	Efficiency of Proposed DHW Heater
$Fuel_{DHW}$	Therms	Annual DHW Fuel Consumption

Montville Township Public Schools
Exhibit D
ECM 2F DHW Replacement
Domestic Hot Water Upgrades

*Inputs are blue

Building	Label	DHW Quantity
Montville High School	MHS-DHW-1	2
Totals		**2**

A. DOMESTIC HOT WATER HEATER REPLACEMENT

	Montville High School
Label	MHS-DHW-1
Quantity	2
Fuel Switch	N
Existing Fuel	Natural Gas
Proposed Fuel	Natural Gas
Current DHW System Efficiency	86.0%
Proposed DHW System Efficiency	96.0%
Improvement DHW System Efficiency	10%
Annual DHW Heater Baseline	5,196
Percentage of DHW Building Load	1
Safety Factor	**0%**
Electric Savings	-
Natural Gas Savings	604
Fuel Oil #2 Savings	-
Fuel Oil #4 Savings	-
Fuel Oil #6 Savings	-
Propane Savings	-

B. STORAGE TANK ISOLATION

Storage Tank Isolation
Current DHW System Efficiency
Improvement in System Efficiency
New System Efficiency
Safety Factor
Electric Savings
Natural Gas Savings
Fuel Oil #2 Savings
Fuel Oil #4 Savings
Fuel Oil #6 Savings
Propane Savings

Montville Township Public Schools
Exhibit D
ECM 2F DHW Replacement
Domestic Hot Water Upgrades

C. OIL PUMP CALCULATION

Oil Pump Savings
Oil Pump HP
Efficiency
Load Factor
Annual Run Hours
Safety Factor (Run Hours)
Adjusted Run Hours
Electric Savings

Montville Township Public Schools
Exhibit D
ECM 2G Pipe Insulation
Piping Insulation

ECM DESCRIPTION

Insulate bare hot water, steam and condensate piping located in boiler rooms and in transition areas. Repair damaged insulation on piping. Insulate condensate storage tanks where applicable. Insulate steam heat exchangers where applicable.

DATA / ASSUMPTIONS

Run Hours	Varies by building
* Insulation "k" Factor of New Piping Insulation	0.270 Btu / ft^2 / °F / hr. / inch

*Respective boiler efficiencies are used

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Visual inspection per scope of work from subcontractor.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	5%

The safety factor for this ECM is taken at 0.05 due to uncertainty of on going steam and hot water piping temperatures incorporated in the savings calculation.

FORMULAE

Detailed energy savings calculations are in the Piping Insulation calculation sheet

* Inputs are in blue

Subcontractor Calculations N * If Yes - Please Refer to tab 'Sub Pipe Insulation' for details

Diameter (in) of Pipe - Input linear feet per diameter

Building	14+	10.00	8.00	6.00	5.00	4.00	3.00	2.50	2.00	1.50	1.00	0.75	0.50
Valley View Elementary School										20.0	20.0		
Building	Label	DHW Quantity											
	0.0	0.1											
	#DIV/0!	-											
	#DIV/0!	-											
	#DIV/0!	-											
	#DIV/0!	-											
	#DIV/0!	-											
Totals	#DIV/0!	0.1	-	-	-	-	-	-	-	20.0	20.0	-	-

CALCULATIONS

	Valley View Elementary School		Building
Total Linear Feet of Insulation	40.0		-
Losses from Bare Pipe	3,521		#VALUE!
Losses from Insulated Pipe	1,787		#VALUE!
Boiler Efficiency	88.0%		#N/A
Thermal Savings (Therms/hr)	0.02		#VALUE!
Safety Factor	5%		0%
Thermal Savings	71		#VALUE!

Montville Township Public Schools
Exhibit D
ECM 2G Pipe Insulation
Piping Insulation

Nominal Pipe Size (inches)	14.00	10.00	8.00	6.00	5.00	4.00	3.00	2.50	2.00	1.50	1.00	0.75	0.50
Contact Temperature of Bare Pipe (baseline)	155	155	155	155	155	155	155	155	155	155	155	155	155
Thickness of Insulation (inches)	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	1.5	1.5	1.5	1.5
Insulation "k" Factor	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270
Pipe Length	1	1	1	1	1	1	1	1	1	1	1	1	1
Hours of Operation	3,814	3,814	3,814	3,814	3,814	3,814	3,814	3,814	3,814	3,814	3,814	3,814	3,814
Temperature of Environment	70	70	70	70	70	70	70	70	70	70	70	70	70
Contact Temperature of Floor	60	60	60	60	60	60	60	60	60	60	60	60	60
Contact Temperature of Ceiling	90	90	90	90	90	90	90	90	90	90	90	90	90
Contact Temperature of walls	75	75	75	75	75	75	75	75	75	75	75	75	75
Initial Insulation Fim Coefficient Estimate	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
Emissivity of Bare Pipe	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Emissivity of Insulated Pipe	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Outside Diameter of Bare Pipe (inches)	14.000	10.750	8.625	6.625	5.563	4.500	3.500	2.875	2.375	1.900	1.315	1.050	0.840
Outside Diameter of Insulated Pipe (inches)	19.000	15.750	13.625	11.625	10.563	8.500	7.500	6.875	6.375	4.900	4.315	4.050	3.840
Characteristic Length of Bare Pipe (feet)	1.167	0.896	0.719	0.552	0.464	0.375	0.292	0.240	0.198	0.158	0.110	0.088	0.070
Characteristic Length of Insulated Pipe (feet)	1.583	1.313	1.135	0.969	0.880	0.708	0.625	0.573	0.531	0.408	0.360	0.338	0.320
Average Film Temp. For Bare Pipe (deg. F)	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5
Average Film Temp. For Insulated Pipe (deg. F)	97	96	95	95	94	96	95	94	94	96	95	94	93
Film Coefficient for Bare Pipe (BTU/hr.F.sqft)	0.789	0.843	0.890	0.951	0.994	1.048	1.116	1.172	1.229	1.300	1.425	1.507	1.594
Film Coefficient for Insulated Pipe (BTU/hr.F.sqft)	0.55	0.57	0.59	0.61	0.62	0.66	0.68	0.69	0.70	0.76	0.78	0.78	0.79
Convective Losses for Bare Pipe (BTU/hr.)	245.85	201.67	170.96	140.27	123.04	104.95	86.92	75.00	64.99	54.97	41.71	35.23	29.80
Convective Losses for Insulated Pipe (BTU/hr.)	115.87	99.95	89.09	78.45	72.59	62.68	56.61	52.69	49.45	41.52	37.30	35.29	33.64
Radiant Losses for Bare Pipe (BTU/hr.)	346	265	213	164	137	111	86	71	59	47	32	26	21
Radiant Losses for Insulated Pipe (BTU/hr.)	22	18	16	13	12	10	9	8	7	6	5	5	4
Total Losses for Bare Pipe (BTU/hr.)	591	467	384	304	260	216	173	146	124	102	74	61	51
Total Losses for Insulated Pipe (BTU/hr.)	138	118	105	92	85	72	65	61	57	47	42	40	38
Savings (BTU/hr.) With Boiler Eff. =	**454**	**349**	**279**	**212**	**176**	**144**	**108**	**85**	**67**	**55**	**32**	**21**	**13**
Savings (MMBTU)	**1.56**	**1.20**	**0.96**	**0.73**	**0.60**	**0.49**	**0.37**	**0.29**	**0.23**	**0.19**	**0.11**	**0.07**	**0.04**

SURFACE TEMPERATURE CALCULATION
14.0 inch pipe

NPS Pipe Size (inches)	14.00	First Iteration Heat Loss	282
Bare Pipe Surface Temperature	155	First Iteration Insulation Surface Temp.	104
Initial Film Coefficient	1.65	First Iteration Film Coefficient	0.621
Insulation Thickness (inches)	2.5	Second Iteration Heat Loss	169
Insulation "K" Factor	0.270	Second Iteration Insulation Surface Temp.	125
Environment Temperature	70	Second Iteration Film Coefficient	0.654
External Pipe Diameter	14	Third Iteration Heat Loss	175
Insulation Surface Temp	**124**	Third Iteration Insulation Surface Temp.	124
		Third Iteration Film Coefficient	0.651
		Fourth Iteration Heat Loss	174
		Fourth Iteration Insulation Surface Temp.	124
		Fourth Iteration Film Coefficient	0.652

SURFACE TEMPERATURE CALCULATION
10.0 inch pipe

NPS Pipe Size (inches)	10.00	First Iteration Heat Loss	229
Bare Pipe Surface Temperature	155	First Iteration Insulation Surface Temp.	104
Initial Film Coefficient	1.65	First Iteration Film Coefficient	0.617
Insulation Thickness (inches)	2.5	Second Iteration Heat Loss	138
Insulation "K" Factor	0.270	Second Iteration Insulation Surface Temp.	124
Environment Temperature	70	Second Iteration Film Coefficient	0.684
External Pipe Diameter	10.75	Third Iteration Heat Loss	147
Insulation Surface Temp	**122**	Third Iteration Insulation Surface Temp.	122
		Third Iteration Film Coefficient	0.677
		Fourth Iteration Heat Loss	146
		Fourth Iteration Insulation Surface Temp.	122
		Fourth Iteration Film Coefficient	0.678

SURFACE TEMPERATURE CALCULATION
3.0 inch pipe

NPS Pipe Size (inches)	3.00	First Iteration Heat Loss	112
Bare Pipe Surface Temper	155	First Iteration Insulation Surface Temp.	105
Initial Film Coefficient	1.65	First Iteration Film Coefficient	0.622
Insulation Thickness (inch	2.0	Second Iteration Heat Loss	67
Insulation "K" Factor	0.270	Second Iteration Insulation Surface Temp.	125
Environment Temperature	70	Second Iteration Film Coefficient	0.827
External Pipe Diameter	3.5	Third Iteration Heat Loss	80
Insulation Surface Te	**120**	Third Iteration Insulation Surface Temp.	119
		Third Iteration Film Coefficient	0.804
		Fourth Iteration Heat Loss	79
		Fourth Iteration Insulation Surface Temp.	120
		Fourth Iteration Film Coefficient	0.806

SURFACE TEMPERATURE CALCULATION
2.5 inch pipe

NPS Pipe Size (inches)	2.50	First Iteration Heat Loss	100
Bare Pipe Surface Temper	155	First Iteration Insulation Surface Temp.	104
Initial Film Coefficient	1.65	First Iteration Film Coefficient	0.618
Insulation Thickness (inch	2.0	Second Iteration Heat Loss	60
Insulation "K" Factor	0.270	Second Iteration Insulation Surface Temp.	124
Environment Temperature	70	Second Iteration Film Coefficient	0.842
External Pipe Diameter	2.875	Third Iteration Heat Loss	72
Insulation Surface Te	**118**	Third Iteration Insulation Surface Temp.	118
		Third Iteration Film Coefficient	0.816
		Fourth Iteration Heat Loss	71
		Fourth Iteration Insulation Surface Temp.	118
		Fourth Iteration Film Coefficient	0.819

Montville Township Public Schools
Exhibit D
ECM 2G Pipe Insulation
Piping Insulation

SURFACE TEMPERATURE CALCULATION 8.0 inch pipe			
		First Iteration Heat Loss	194
		First Iteration Insulation Surface Temp.	103
		First Iteration Film Coefficient	0.614
		Second Iteration Heat Loss	117
NPS Pipe Size (inches)	8.00	Second Iteration Insulation Surface Temp.	123
Bare Pipe Surface Temperature	155	Second Iteration Film Coefficient	0.707
Initial Film Coefficient	1.65	Third Iteration Heat Loss	128
Insulation Thickness (inches)	2.5	Third Iteration Insulation Surface Temp.	121
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.698
Environment Temperature	70	Fourth Iteration Heat Loss	127
External Pipe Diameter	8.625	Fourth Iteration Insulation Surface Temp.	121
Insulation Surface Temp	**121**	Fourth Iteration Film Coefficient	0.699

SURFACE TEMPERATURE CALCULATION 6.0 inch pipe			
		First Iteration Heat Loss	160
		First Iteration Insulation Surface Temp.	102
		First Iteration Film Coefficient	0.609
		Second Iteration Heat Loss	98
NPS Pipe Size (inches)	6.00	Second Iteration Insulation Surface Temp.	123
Bare Pipe Surface Temperature	155	Second Iteration Film Coefficient	0.733
Initial Film Coefficient	1.65	Third Iteration Heat Loss	109
Insulation Thickness (inches)	2.5	Third Iteration Insulation Surface Temp.	119
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.720
Environment Temperature	70	Fourth Iteration Heat Loss	108
External Pipe Diameter	6.625	Fourth Iteration Insulation Surface Temp.	119
Insulation Surface Temp	**119**	Fourth Iteration Film Coefficient	0.721

SURFACE TEMPERATURE CALCULATION 5.0 inch pipe			
		First Iteration Heat Loss	142
		First Iteration Insulation Surface Temp.	101
		First Iteration Film Coefficient	0.606
		Second Iteration Heat Loss	87
NPS Pipe Size (inches)	5.00	Second Iteration Insulation Surface Temp.	122
Bare Pipe Surface Temperature	155	Second Iteration Film Coefficient	0.749
Initial Film Coefficient	1.65	Third Iteration Heat Loss	99
Insulation Thickness (inches)	2.5	Third Iteration Insulation Surface Temp.	118
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.732
Environment Temperature	70	Fourth Iteration Heat Loss	98
External Pipe Diameter	5.563	Fourth Iteration Insulation Surface Temp.	118
Insulation Surface Temp	**118**	Fourth Iteration Film Coefficient	0.734

SURFACE TEMPERATURE CALCULATION 4.0 inch pipe			
		First Iteration Heat Loss	131
		First Iteration Insulation Surface Temp.	106
		First Iteration Film Coefficient	0.627
		Second Iteration Heat Loss	78
NPS Pipe Size (inches)	4.00	Second Iteration Insulation Surface Temp.	126
Bare Pipe Surface Temperature	155	Second Iteration Film Coefficient	0.804
Initial Film Coefficient	1.65	Third Iteration Heat Loss	91
Insulation Thickness (inches)	2.0	Third Iteration Insulation Surface Temp.	121
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.786
Environment Temperature	70	Fourth Iteration Heat Loss	90
External Pipe Diameter	4.5	Fourth Iteration Insulation Surface Temp.	121
Insulation Surface Temp	**121**	Fourth Iteration Film Coefficient	0.788

SURFACE TEMPERATURE CALCULATION 2.0 inch pipe			
		First Iteration Heat Loss	90
		First Iteration Insulation Surface Temp.	103
		First Iteration Film Coefficient	0.613
		Second Iteration Heat Loss	55
NPS Pipe Size (inches)	2.00	Second Iteration Insulation Surface Temp.	123
Bare Pipe Surface Temper	155	Second Iteration Film Coefficient	0.854
Initial Film Coefficient	1.65	Third Iteration Heat Loss	66
Insulation Thickness (inch	2.0	Third Iteration Insulation Surface Temp.	116
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.826
Environment Temperature	70	Fourth Iteration Heat Loss	65
External Pipe Diameter	2.375	Fourth Iteration Insulation Surface Temp.	117
Insulation Surface Te	**117**	Fourth Iteration Film Coefficient	0.829

SURFACE TEMPERATURE CALCULATION 1.5 inch pipe			
		First Iteration Heat Loss	82
		First Iteration Insulation Surface Temp.	109
		First Iteration Film Coefficient	0.641
		Second Iteration Heat Loss	48
NPS Pipe Size (inches)	1.50	Second Iteration Insulation Surface Temp.	128
Bare Pipe Surface Temper	155	Second Iteration Film Coefficient	0.933
Initial Film Coefficient	1.65	Third Iteration Heat Loss	61
Insulation Thickness (inch	1.5	Third Iteration Insulation Surface Temp.	121
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.902
Environment Temperature	70	Fourth Iteration Heat Loss	60
External Pipe Diameter	1.9	Fourth Iteration Insulation Surface Temp.	122
Insulation Surface Te	**122**	Fourth Iteration Film Coefficient	0.905

SURFACE TEMPERATURE CALCULATION 1.0 inch pipe			
		First Iteration Heat Loss	69
		First Iteration Insulation Surface Temp.	107
		First Iteration Film Coefficient	0.632
		Second Iteration Heat Loss	40
NPS Pipe Size (inches)	1.00	Second Iteration Insulation Surface Temp.	127
Bare Pipe Surface Temper	155	Second Iteration Film Coefficient	0.957
Initial Film Coefficient	1.65	Third Iteration Heat Loss	52
Insulation Thickness (inch	1.5	Third Iteration Insulation Surface Temp.	118
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.920
Environment Temperature	70	Fourth Iteration Heat Loss	51
External Pipe Diameter	1.315	Fourth Iteration Insulation Surface Temp.	119
Insulation Surface Te	**119**	Fourth Iteration Film Coefficient	0.923

SURFACE TEMPERATURE CALCULATION 0.8 inch pipe			
		First Iteration Heat Loss	62
		First Iteration Insulation Surface Temp.	106
		First Iteration Film Coefficient	0.626
		Second Iteration Heat Loss	37
NPS Pipe Size (inches)	0.75	Second Iteration Insulation Surface Temp.	126
Bare Pipe Surface Temper	155	Second Iteration Film Coefficient	0.967
Initial Film Coefficient	1.65	Third Iteration Heat Loss	48
Insulation Thickness (inch	1.5	Third Iteration Insulation Surface Temp.	117
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	0.927
Environment Temperature	70	Fourth Iteration Heat Loss	47
External Pipe Diameter	1.05	Fourth Iteration Insulation Surface Temp.	118
Insulation Surface Te	**118**	Fourth Iteration Film Coefficient	0.931

SURFACE TEMPERATURE CALCULATION 0.5 inch pipe			
		First Iteration Heat Loss	**57**
		First Iteration Insulation Surface Temp.	**104**
		First Iteration Film Coefficient	**0.620**
		Second Iteration Heat Loss	**34**
NPS Pipe Size (inches)	0.50	Second Iteration Insulation Surface Temp.	**125**
Bare Pipe Surface Temper	155	Second Iteration Film Coefficient	**0.976**
Initial Film Coefficient	1.65	Third Iteration Heat Loss	**44**
Insulation Thickness (inch	1.5	Third Iteration Insulation Surface Temp.	**115**
Insulation "K" Factor	0.270	Third Iteration Film Coefficient	**0.931**
Environment Temperature	70	Fourth Iteration Heat Loss	**43**
External Pipe Diameter	0.84	Fourth Iteration Insulation Surface Temp.	**116**
Insulation Surface Te	**116**	Fourth Iteration Film Coefficient	**0.936**

Montville Township Public Schools
Exhibit D
ECM 2G Pipe Insulation
Piping Insulation

SURFACE TEMPERATURE CALCULATION Use this section to find the expected insulation surface temperature if unknown or evaluating project potential		First Iteration Heat Loss	219
		First Iteration Insulation S	104
		First Iteration Film Coeffic	0.621
		Second Iteration Heat Loss	179
NPS Pipe Size (inches)	10	Second Iteration Insulatio	145
Bare Pipe Surface Temperature	325	Second Iteration Film Coe	0.754
Initial Film Coefficient	1.65	Third Iteration Heat Loss	189
Insulation Thickness (inches)	2	Third Iteration Insulation S	135
Insulation "K" Factor	0.05	Third Iteration Film Coeffi	0.728
Environment Temperature	70	Fourth Iteration Heat Loss	187
External Pipe Diameter	10.75	Fourth Iteration Insulation	137
Insulation Surface Temp	**137**	Fourth Iteration Film Coef	0.732

This spreadsheet calculates insulation performance and bare pipe thermal losses for schedule 40 steel horizontal pipes. The calculation computes natural convective and radiant losses based on actual conditions using the Stephan-Boltzmann, radial heat flow and Nusselt equations. This calculation does not depend on insulation "k" factors but rather actual measured temperature data.

To use this spreadsheet, simply fill in all the blue cells. The tan cells contain fixed data or calculations and should not normally require change. All temperatures are in degrees F. If the nominal pipe size (NPS) for an application is greater than 10 inches, or other than listed, use the "OTHER" column. Other parameters will then be calculated automatically. If the insulation temp is known, insert the figures in row 20, (this color) otherwise the program will calculate an estimated value for you.

0.50	0.75	1.00	1.25	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	8.00	10.00	12.00	14.00
0.84	1.05	1.32	1.66	1.90	2.38	2.88	3.50	4.00	4.50	5.56	6.63	8.63	10.75	12.75	14.00

Montville Township Public Schools
Exhibit D
ECM 2H Kitchen Hood Controls
Kitchen Hood Controls

ECM DESCRIPTION

Kitchen hoods in the district's kitchens are ventilated by exhaust fans. Fans are running most of the time at full speed when kitchen is in operation even if there are no activities under the hoods. e new ventilaton control systems will control exhaust fans based on hood exhaust temperatures. The exhaust fan will be equipped with VFDs will control air flows. If the exhaust fan is combined with a make up air unit, then variable air flow will be controlled on both exhaust and make up air fans.

DATA / ASSUMPTIONS

Existing equipment schedule was given by personnel operating the kitchen equipment and with interviews with facility staff

MEASUREMENT AND VERIFICATION

Option A (Both Electric and Fuel) - Measure kW, logging fan operation and calculate energy savings, both electric and fuel, from collected data with fan and make up air information from manufacturer.

COMMISSIONING

Test exhaust fans and make up air units that they operate per design intent, which include simulation of the exhaust temperature driving fan motor speeds. Verify all safety interlocks.

RECOVERY/SAFETY FACTOR

Recovery/Safety Factor (Electric) =	0%
Recovery/Safety Factor (Thermal) =	0%

Savings calculations are based on weather bin data, make up air flow and operating schedules. A more conservative is used for heating losses due to the uncertainty of the basic operating information in terms of the volume of air being exhausted and other operating perimeters. The heating fuel saving calculations are based upon information provided by the equipment vendor. The exhaust fan electric savings are based on existing fan schedules and proposed fan schedules. Recovery factor of the electric savings is less conservative due to knowledge of technical data and agreed operating schedule.

FORMULAE

$W_{SAVINGS} = (W_{FAN} - W_{FAN})$

$Q_{SAVINGS} = (Q_{HOOD} - Q_{HOOD}) / n_{Boiler}$

$W_{FAN} = \sum_{0\%}^{100\%} HP \cdot Lf \cdot .746 \cdot t_{HOOD}$

$W_{FAN} = \sum_{0\%}^{100\%} (HP \cdot Lf \cdot .746) \cdot RPM_{\%}^{3} \cdot t_{HOOD}$

$Q_{HOOD} = (1.08 \cdot V_{EX} \cdot HD_{OCC} \cdot (t_{HOOD} / t_{HOOD} + t_{OCC})) / (n_{sys} \cdot 100{,}000)$

$Q_{HOOD} = (1.08 \cdot V_{EX} \cdot HD_{OCC} \cdot (t_{HOOD} / t_{HOOD} + t_{OCC})) / (n_{sys} \cdot 100{,}000)$

$V_{EX} = V_{EX} \cdot RPM_{W}$

Montville Township Public Schools
Exhibit D
ECM 2H Kitchen Hood Controls
Kitchen Hood Controls

Variable	Units	Description	
$W_{savings}$	kWh	kWh Savings	
$Q_{savings}$	Therms	Thermal Savings	
W_{FAN}	Building	Label	**DHW Quantity**
W_{FAN}	kWh	0	**0**
		0	**0**
HP	HP	0	**0**
$\sum_{0\%}^{100\%}$	-	0	**0**
$RPM_{\%}$	RPM	0	**0**
RPM_{W}	RPM	0	**0**
Lf	-	Load Factor of motor	
η_{sys}	-	Existing system efficiency	
V_{EX}	CFM	Current Exhaust Volume	
V_{EX}	CFM	Proposed Exhaust Volume	
Q_{HOOD}	Therms	Existing Heat Load of Kitchen Hood	
Q_{HOOD}	Therms	Proposed Heat Load of Kitchen Hood	
T_{OCC}	°F	Existing temperature of space during occupied hours	
η_{Boiler}	-	Existing system efficiency	
t_{HOOD}	Hrs	Existing Hood Run Hours	
t_{OCC}	Hrs	Occupied Bin Hours	
HD_{OCC}	Hrs	Existing occupied heating degree hours	

* Inputs are in blue

Building	Kitchen Hood Area (ft^2)	HP of Exhaust Fan Motor	HP of MAU Motor	Annual Run Hours	System Efficiency	Current Exhaust Volume (CFM)
Montville High School	140	5.0	2.0	1,440	65%	10,500
Lazar Middle School	64	3.0	1.5	1,440	65%	4,800
Totals	**204**	**8.0**	**3.5**			**15,300**

Montville Township Public Schools
Exhibit D
ECM 2H Kitchen Hood Controls
Kitchen Hood Controls

	Montville High School	Lazar Middle School	Total	
Kitchen Hood Area	140	64	**204**	ft^2
HP of Fan Motor	5	3.0	**8**	HP
HP Fan MAU Motor	2.0	1.5	**4**	HP
Load Factor	**80%**	**75%**		
Annual Run Hours	1,440	1,440		Hrs/Yr
System Efficiency	65%	65%		%
Current Exhaust Volume	10,500	4,800		CFM
Proposed Exhaust Volume	6,773	3,096		CFM
Existing Heat Load	5,019	2,294		
Proposed Heat Load	3,237	1,480		
Existing Occupied Heating Setpoint	70.0	70.0		°F
Existing Occupied Cooling Setpoint	75.0	75.0		°F
Existing Unoccup. Cooling Setpoint	80.0	80.0		°F
Boiler Efficiency	88.0%	88.0%		%
Safety Factor	**0%**	**0%**		%
Electrical Savings	4,078	2,458	**6,536**	kWh/Yr
Thermal Savings	2,025	926	**2,950**	Therms/Yr

ELECTRICAL CALCULATIONS

MONTVILLE HIGH SCHOOL

Variable Exhaust Volume Analysis

% Rated RPM	% Run Time	Time Hrs/Yr	Weighted RPM	Existing kWh	Proposed kWh	kWh Savings
100%	10%	144	10%	602	602	0
90%	5%	72	5%	301	219	82
80%	5%	72	4%	301	154	147
70%	15%	216	11%	902	310	593
60%	30%	432	18%	1,805	390	1,415
50%	35%	504	18%	2,106	263	1,842
40%	0%	-	0%	0	0	0
30%	0%	-	0%	0	0	0
20%	0%	-	0%	0	0	0
10%	0%	-	0%	0	0	0
Total		1,440	**65%**	**6,016**	**1,937**	**4,078**

LAZAR MIDDLE SCHOOL

Variable Exhaust Volume Analysis

% Rated RPM	% Run Time	Time Hrs/Yr	Weighted RPM	Existing kWh	Proposed kWh	kWh Savings
100%	10%	144	10%	363	363	0
90%	5%	72	5%	181	132	49
80%	5%	72	4%	181	93	88
70%	15%	216	11%	544	187	357
60%	30%	432	18%	1,088	235	853
50%	35%	504	18%	1,269	159	1,110
40%	0%	-	0%	0	0	0
30%	0%	-	0%	0	0	0
20%	0%	-	0%	0	0	0
10%	0%	-	0%	0	0	0
Total		1,440	**65%**	**3,626**	**1,168**	**2,458**

Montville Township Public Schools
Exhibit D
ECM 2I Walk In Compressor Controls
Walk-In Freezer/Cooler Controllers

ECM DESCRIPTION

Installation of a refrigeration controller made by intellidyne on walk-in freezers and refrigerators. This will reduce cycling and improve operating efficiency of the compressor.

DATA / ASSUMPTIONS

Assumed compressor and controller savings	15%	
Assumed Run Hours	4,200	Hours
Assumed Refrig kW	1.152	kW
Assumed Freezer kW	2.863	kW

MEASUREMENT AND VERIFICATION

Option A - Measure kW of selected freezer compressors. Logging compressor operation before and after the controller installations. Calculate savings based on measured results.

COMMISSIONING

Test compressors after installation.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

Recovery factor taken at 0 due to few installations and not proven savings record.

FORMULAE

$$W_{SAVINGS} = (\ kW_{REFRIG} + kW_{FREEZER}\ ) \cdot t \cdot \delta_{\%SAVINGS}$$

Variable	Units	Description
$W_{savings}$	kWh	Electrical Savings for Motor Replacement
kW_{REFRIG}	kW	Horsepower of motor
$kW_{FREEZER}$	kW	Existing Run Hours
t	Hrs	Run hours (assumed)
$\delta_{\%SAVINGS}$	%	Compressor and controller savings (assumed)

Montville Township Public Schools
Exhibit D
ECM 2I Walk In Compressor Controls
Walk-In Freezer/Cooler Controllers

*Inputs are blue

Building	Location	No. of Walk-In Refrigators	No. of Walk-In Freezers	kW of Refrigator	kW of Freezer
Montville High School	Kitchen	1	-	1.152	0.000
Building	Kitchen	1	-	1.152	0.000
Montville High School	Kitchen	-	1	0.000	2.863
Lazar Middle School	Kitchen	1	-	1.152	0.000
Lazar Middle School	Kitchen	-	1	0.000	2.863
Totals	-	3	2	3.5	5.7

Montville Township Public Schools
Exhibit D
ECM 2I Walk In Compressor Controls
Walk-In Freezer/Cooler Controllers

CALCULATIONS

	Montville High School	Building	Montville High School	Lazar Middle School	Lazar Middle School
No. of Walk-In Refrigerators	1	1	0	1	0
No. of Walk-In Freezers	0	0	1	0	1
kW of Refrigerator	1.152	1.152	-	1.152	-
kW of Freezer	-	-	2.863	-	2.863
Run Hours	4,200	4,200	4,200	4,200	4,200
Total Electrical Consumption	4838.4	4,838	12,025	4,838	12,025
Compressor and Controller Savings	15%	15%	15%	45%	15%
Safety Factor	**0%**	**0%**	**0%**	**0%**	**0%**
Electrical Savings	726	726	1,804	2,177	1,804

Montville Township Public Schools
Exhibit D
ECM 3A Transformers
Transformer Replacement

ECM DESCRIPTION

Replace dry transformers with new custom designed high efficiency transformers. New transformers will save electricity and avoid the future replacements due to failure.

DATA / ASSUMPTIONS
*Input Measured kW losses (If kW losses are not none calculation will calculate efficiency using past results)
* Existing loads were obtained by data logging
* Existing efficiencies were obtained by data logging or manufacturer specifications

MEASUREMENT AND VERIFICATION

Option A - Direct kW and savings measurements before and after installation conducted. A report is generated showing the reduction in kW

COMMISSIONING

Test all transformers after installation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

Recovery factor is set at 10% due to unknown flucuations in transformer loads

FORMULAE

$W_{SAVINGS} = e_T - e_T$

$e_T = e_{OCC} * t_{OCC} + e_{UNOCC} * t_{UNOCC}$
$e_T = e_{OCC} * t_{OCC} + e_{UNOCC} * t_{UNOCC}$

$e_{OCC} = [(t_{OCC} * kVA) / \eta_t^{OCC}] - (kVA * t_{OCC})$
$e_{OCC} = [(t_{OCC} * kVA) / \eta_t^{OCC}] - (kVA * t_{OCC})$

$e_{UNOCC} = [(t_{OCC} * kVA) / \eta_t^{UNOCC}] - (kVA * t_{OCC})$
$e_{UNOCC} = [(t_{OCC} * kVA) / \eta_t^{UNOCC}] - (kVA * t_{OCC})$

$\eta_t^{OCC} = t_{OCC} * kVA * \eta_T$
$\eta_t^{OCC} = t_{OCC} * kVA * \eta_T$

$\eta_t^{UNOCC} = t_{UNOCC} * kVA * \eta_T$
$\eta_t^{UNOCC} = t_{t,}$ Building

	Label	DHW Quantity
	Y	Y
	57737	**57739**
Variable	Old Boiler Rm	Room 342
$W_{savings}$	LPX2	CP-E1
e_T	1	1
e_T	25	30
t_{OCC}	Existing Run Hours	
t_{UNOCC}	Proposed Run Hours	
e_{OCC}	Existing transformer losses during occupied hours	
e_{OCC}	Proposed transformer losses during occupied hours	
e_{UNOCC}	Existing transformer losses during unoccupied hours	
e_{UNOCC}	Proposed transformer losses during unoccupied hours	
kVA	kVA of existing transformer	
t_{OCC}	Load Factor of transformer during occupied hours	
t_{UNOCC}	Load Factor of transformer during unoccupied hours	
η_t^{OCC}	Existing efficiency of transformer during occupied hours	
η_t^{OCC}	Proposed efficiency of transformer during occupied hours	
η_t^{UNOCC}	Existing efficiency of transformer during unoccupied hours	
η_t^{UNOCC}	Proposed efficiency of transformer during unoccupied hours	
η_T	Existing weighted efficiency of transformer at various loads	
η_T	Proposed weighted efficiency of transformer at various loads	

* Inputs are in blue
Calculation is automatic. If Efficiencies are known override automatically generated efficiencies in Columns G through M when necessary

							EXISTING						PROPOSED			
Building	Replace	Tag Number	Location ID	Transormer Designation	Qty	kVA	% Load During Occupied Hours	% Load During Unoccupied Hours	Baseline kW Losses (Normal Operation)	Baseline kW Losses (Outside Op. hrs)	Efficiency at Occupied Loads	Efficiency at Unoccupied Loads	New Transformer kW Losses (Normal Operation)	New Transformer kW Losses (Outside Op. hrs)	Efficiency Occupied Loads	Efficiency Unoccupied Loads
Montville High School	y	57735	Elec Re FEMIY Hallway	GRP	1.00	112.5	2.9%	2.9%	1.157	1.157	92.50%	90.52%	0.167	0.167	98.20%	97.80%
Montville High School	y	57736	Old Boiler Rm	TX1	1.00	500.0	5.7%	2.0%	3.297	3.272	94.48%	91.57%	0.584	0.561	98.45%	98.12%
Montville High School	y	57737	Old Boiler Rm	LPX2	1.00	25.0	8.7%	3.0%	0.398	0.392	86.88%	81.90%	0.062	0.058	96.75%	95.75%
Montville High School	y	57739	Room 342	CP-E1	1.00	30.0	2.9%	2.9%	1.157	1.157	89.89%	85.78%	0.167	0.167	96.90%	95.90%
Montville High School	y	57740	Electric Rm by 518	0	1.00	112.5	4.5%	2.0%	0.906	0.902	92.50%	90.52%	0.116	0.112	98.20%	97.80%
Montville High School	y	57741	Electric Rm by 518	CP-1A	1.00	75.0	5.9%	3.0%	0.630	0.626	93.00%	91.00%	0.084	0.079	97.30%	96.20%
Montville High School	y	57742	New Boiler Rm	PP-2	1.00	45.0	9.3%	4.0%	0.659	0.648	90.53%	86.68%	0.092	0.081	97.10%	96.10%
Montville High School	y	57743	New Boiler Rm	RP-1	1.00	45.0	2.9%	1.0%	1.157	1.155	90.53%	86.68%	0.167	0.164	97.10%	96.10%
Montville High School	y	57744	New Boiler Rm	CP-1	1.00	112.5	2.5%	2.5%	0.601	0.601	92.50%	90.52%	0.079	0.079	98.20%	97.80%
Montville High School	y	57746	Electric Rm by 607 2nd FL	CP-2B	1.00	45.0	0.8%	0.8%	0.884	0.884	90.53%	86.68%	0.111	0.111	97.10%	96.10%
Montville High School	y	57747	Electric Rm by 607 2nd FL	RP-2B	1.00	30.0	5.9%	3.0%	0.630	0.626	89.89%	85.78%	0.084	0.079	96.90%	95.90%
Montville High School	y	57748	Electric Rm 609B	RP-2A	1.00	75.0	5.9%	3.0%	0.630	0.626	93.00%	91.00%	0.084	0.079	97.30%	96.20%
Montville High School	y	57749	Electric Rm 609B	CP-2A	1.00	45.0	5.9%	3.0%	0.630	0.626	90.53%	86.68%	0.084	0.079	97.10%	96.10%
Lazar Middle School	y	57752	Electric Rm outside of Library	CP-3	1.00	45.0	5.9%	3.0%	0.630	0.626	90.53%	86.68%	0.084	0.079	97.10%	96.10%
Lazar Middle School	y	57753	Electric Rm 4	CP-1	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Lazar Middle School	y	57754	Electric Rm 5	CP2	1.00	45.0	5.9%	3.0%	0.630	0.626	90.53%	86.68%	0.084	0.079	97.10%	96.10%
Lazar Middle School	y	57757	Electric Rm 6	CP-5	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Woodmont Elementary School	y	57758	Electric Rm 1 by Custodian Office	CDP	1.00	75.0	3.4%	1.0%	0.830	0.827	93.00%	91.00%	0.114	0.111	97.30%	96.20%
Woodmont Elementary School	y	57759	Electric Rm 4 by 18	DK	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Hilldale Elementary School	y	57761	Electric Rm 4 in Library	CP	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Hilldale Elementary School	y	57762	Electric Rm 4 in Library	MDP	1.00	75.0	3.4%	1.0%	0.830	0.827	93.00%	91.00%	0.114	0.111	97.30%	96.20%
Hilldale Elementary School	y	57763	Copy Rm	RP-1	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Valley View Elementary School	y	57764	Gym Storage	RP	1.00	75.0	4.8%	2.0%	0.701	0.696	93.00%	91.00%	0.117	0.112	97.30%	96.20%
Valley View Elementary School	y	57766	Boiler Rm	CDP	1.00	112.5	2.9%	2.9%	1.157	1.157	92.50%	90.52%	0.167	0.167	98.20%	97.80%
Valley View Elementary School	y	57767	2nd FL Electric Rm 6	CPA	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Valley View Elementary School	y	57768	2nd FL Electric Rm 5 by 24	CPD	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Cedar Hill Elementary School	y	57769	Electric Rm 3 by 13	CDP	1.00	75.0	3.4%	1.0%	0.830	0.827	93.00%	91.00%	0.114	0.111	97.30%	96.20%
William Mason Elementary School	y	57772	Electric Rm 4 by Custodian Office	CDP	1.00	75.0	3.4%	1.0%	0.830	0.827	93.00%	91.00%	0.114	0.111	97.30%	96.20%
William Mason Elementary School	y	57773	Electric Rm 4 by Custodian Office	CP	1.00	30.0	3.1%	1.0%	0.435	0.434	89.89%	85.78%	0.058	0.057	96.90%	95.90%
Totals					**29**	**2070**										

Montville Township Public Schools
Exhibit D
ECM 3A Transformers
Transformer Replacement

CALCULATIONS

	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Montville High School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Lazar Middle School	Woodmont Elementary School	Woodmont Elementary School	Hilldale Elementary School	Hilldale Elementary School	Hilldale Elementary School	Valley View Elementary School	Valley View Elementary School	Valley View Elementary School	Valley View Elementary School	Cedar Hill Elementary School	William Mason Elementary School	William Mason Elementary School		TOTAL
Replace Transformer	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
kVa	112.5	500.0	25.0	30.0	112.5	75.0	45.0	45.0	112.5	45.0	30.0	75.0	45.0	45.0	30.0	45.0	30.0	75.0	30.0	30.0	75.0	30.0	75.0	112.5	30.0	30.0	75.0	75.0	30.0		**1,297.50**
Quantity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		**14.00**
% Load at Occupied Hours	3%	6%	9%	3%	4%	6%	9%	3%	3%	1%	6%	6%	6%	6%	3%	6%	3%	3%	3%	3%	3%	3%	5%	3%	3%	3%	3%	3%	3%		
% Load at Unoccupied Hours	3%	2%	3%	3%	2%	3%	4%	1%	3%	1%	3%	3%	3%	3%	1%	3%	1%	1%	1%	1%	1%	1%	2%	3%	1%	1%	1%	1%	1%		
Estimated Efficiences																															
Existing Efficiency at Occupied Loads	92.5%	94.5%	86.9%	89.9%	92.5%	93.0%	90.5%	90.5%	92.5%	90.5%	89.9%	93.0%	90.5%	90.5%	89.9%	90.5%	89.9%	93.0%	89.9%	89.9%	93.0%	89.9%	93.0%	92.5%	89.9%	89.9%	93.0%	93.0%	89.9%		
Existing Efficiency at Unoccupied Loads	90.5%	91.6%	81.9%	85.8%	90.5%	91.0%	86.7%	86.7%	90.5%	86.7%	85.8%	91.0%	86.7%	86.7%	85.8%	86.7%	85.8%	91.0%	85.8%	85.8%	91.0%	85.8%	91.0%	90.5%	85.8%	85.8%	91.0%	91.0%	85.8%		
Proposed Efficiency at Occupied Loads	98.2%	98.5%	96.8%	96.9%	98.2%	97.3%	97.1%	97.1%	98.2%	97.1%	96.9%	97.3%	97.1%	97.1%	96.9%	97.1%	96.9%	97.3%	96.9%	96.9%	97.3%	96.9%	97.3%	98.2%	96.9%	96.9%	97.3%	97.3%	96.9%		
Proposed Efficiency at Unoccupied Loads	97.8%	98.1%	95.8%	95.9%	97.8%	96.2%	96.1%	96.1%	97.8%	96.1%	95.9%	96.2%	96.1%	96.1%	95.9%	96.1%	95.9%	96.2%	95.9%	95.9%	96.2%	95.9%	96.2%	97.8%	95.9%	95.9%	96.2%	96.2%	95.9%		
Measured Baseline Losses																															
Existing Losses at Occupied Loads	1.157	3.297	0.398	1.157	0.906	0.630	0.659	1.157	0.601	0.884	0.630	0.630	0.630	0.630	0.435	0.630	0.435	0.830	0.435	0.435	0.830	0.435	0.701	1.157	0.435	0.435	0.830	0.830	0.435		
Existing Losses at Unoccupied Loads	1.157	3.272	0.392	1.157	0.902	0.626	0.648	1.155	0.601	0.884	0.626	0.626	0.626	0.626	0.434	0.626	0.434	0.827	0.434	0.434	0.827	0.434	0.696	1.157	0.434	0.434	0.827	0.827	0.434		
Proposed Losses at Occupied Loads	0.167	0.584	0.062	0.167	0.116	0.084	0.092	0.167	0.079	0.111	0.084	0.084	0.084	0.084	0.058	0.084	0.058	0.114	0.058	0.058	0.114	0.058	0.117	0.167	0.058	0.058	0.114	0.114	0.058		
Proposed Losses at Unoccupied Loads	0.167	0.561	0.058	0.167	0.112	0.079	0.081	0.164	0.079	0.111	0.079	0.079	0.079	0.079	0.057	0.079	0.057	0.111	0.057	0.057	0.111	0.057	0.112	0.167	0.057	0.057	0.111	0.111	0.057		
Measured kW Losses																															
Existing kW Losses Occupied Hours	0.990	2.713	0.336	0.990	0.790	0.546	0.566	0.991	0.522	0.773	0.546	0.546	0.546	0.546	0.377	0.546	0.377	0.716	0.377	0.377	0.716	0.377	0.584	0.990	0.377	0.377	0.716	0.716	0.377		
Existing kW Losses Unoccupied Hours	0.990	2.711	0.334	0.990	0.790	0.546	0.567	0.991	0.522	0.773	0.546	0.546	0.546	0.546	0.377	0.546	0.377	0.716	0.377	0.377	0.716	0.377	0.584	0.990	0.377	0.377	0.716	0.716	0.377		
Estimated kW Losses based on Efficiences																															
Existing kW Losses Occupied Hours Calculated	0.265	1.6651	0.3285	0.0979	0.4099	0.3331	0.4387	0.1377	0.2305	0.0377	0.1992	0.3331	0.2777	0.2777	0.1033	0.2777	0.1047	0.1919	0.1047	0.1047	0.1919	0.1047	0.2698	0.2645	0.1047	0.1047	0.1919	0.1919	0.1047		
Existing kW Losses Unoccupied Hours Calculated	0.342	2.6234	0.4808	0.1442	0.5294	0.4376	0.6445	0.2024	0.2977	0.0553	0.2934	0.4376	0.4080	0.4080	0.1522	0.4080	0.1542	0.2522	0.1542	0.1542	0.2522	0.1542	0.3546	0.3417	0.1542	0.1542	0.2522	0.2522	0.1542		
Occupancy																															
Occupied Hours per Day	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**		
Occupied Days per Year	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**		
Estimated kWh Losses based on Efficiences																															
Existing Annual kWh Losses	2,808	20,681	3,846	1,152	4,351	3,583	5,152	1,618	2,446	442	2,344	3,583	3,261	3,261	1,216	3,261	1,232	2,065	1,232	1,232	2,065	1,232	2,903	2,808	1,232	1,232	2,065	2,065	1,232		
Proposed kW and kWh Losses based on Efficiences																															
Proposed kW Losses Occupied Hours	0.0598	0.4487	0.0731	0.0278	0.0927	0.1228	0.1253	0.0393	0.0521	0.0108	0.0566	0.1228	0.0793	0.0793	0.0294	0.0793	0.0298	0.0708	0.0298	0.0298	0.0708	0.0298	0.0995	0.0598	0.0298	0.0298	0.0708	0.0708	0.0298		
Proposed kW Losses Unoccupied Hours	0.0734	0.1916	0.0333	0.0372	0.0506	0.0889	0.0730	0.0183	0.0633	0.0146	0.0385	0.0889	0.0548	0.0548	0.0128	0.0548	0.0128	0.0296	0.0128	0.0128	0.0296	0.0128	0.0593	0.0734	0.0128	0.0128	0.0296	0.0296	0.0128		
Proposed Annual kWh Losses	610	2,295	387	303	544	860	765	211	527	119	381	860	539	539	152	539	153	358	153	153	358	153	616	610	153	153	358	358	153		
Safety Factor	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**	**10%**		
Total kW and kWh Savings																															
kW Savings	0.990	2.713	0.336	0.990	0.790	0.546	0.566	0.991	0.522	0.773	0.546	0.546	0.546	0.546	0.377	0.546	0.377	0.716	0.377	0.377	0.716	0.377	0.584	0.990	0.377	0.377	0.716	0.716	0.377		**11.40**
kWh Savings	8,675	23,755	2,932	8,675	6,921	4,786	4,965	8,681	4,571	6,768	4,439	4,439	4,439	4,439	3,062	4,439	3,062	5,818	3,062	3,062	5,818	3,062	4,744	8,046	3,062	3,062	5,818	5,818	3,062		**98,485**

Montville Township Public Schools
Exhibit D
ECM 4A Building Envelope Improvements
Building Envelope Improvements

ECM DESCRIPTION

Reduce building infiltration by weather stripping doors, sealing roof & wall joints, duct & piping penetrations, skylight perimeters and window corners.

DATA / ASSUMPTIONS

*Crack area determined by survey team

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Visual inspection per scope of work from subcontractor. Inspection might include smoke test.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Recovery factor taken at 10% due to the uncertainty of variables incorporated in the savings calculations

Montville Township Public Schools
Exhibit D
ECM 4A Building Envelope Improvements
Building Envelope Improvements

FORMULAE

H = (K * Q_{INF} * (dp)^n * HDD * 10) / 28,900 where 28,900 = Heating efficiency factor = (1,000,000 Btu per MMBtu / (1.08 * 24 hr/day)) * 75% std htg efficiency

C = T * C2 * CDD where T = C1 * Q_{INF} * h

Q_{INF} = K * dp^n *A_{CRACK}

dp^n = 5.16

A_{CRACK} = A_{VENTS} + A_{WIN} + A_{RTU} + A_{DOORS} + A_{BULK} + $A_{ROOF/WALL}$

Variable	Units	Description	
H	therms	Thermal Savings associated with air infiltration reduction	
C	kWh	Electrical Savings associated with air infiltration reduction	
Q_{INF}	cfm	Infiltration air flow savings	
A_{CRACK}	ft^2	Total square feet of infiltration area	
K	(ft^3 / min) / (Pa * ft^2)	Flow Factor	
dp^n	Pa	Pressure difference across building envelope raised to nth power	
CDD	(^oF-Day)/Yr	Cooling degree days	
T	tons	Cooling load	
h	Btu/lb	Avg. enthalpy of air	
HDD	(°F-Day)/Yr	Annual heating degree days	
C1	Building	Label	DHW Quantity
C2	kW/ton	0	0
A_{VENTS}	ft^2	0	0
A_{WIN}	ft^2	0	0
A_{RTU}	ft^2	0	0
A_{DOORS}	ft^2	0	0
A_{BULK}	ft^2	0	0
$A_{ROOF/WALL}$	ft^2	Total square feet of infiltration spaces with regards to the wall roof joint	

Source: Public Works Canada Standards & Guidelines,: EC128 April 30, 1980

ASSUMPTIONS / DATA

Subcontractor Calculations N * If Yes - Please Refer to tab 'Sub BEI Calculation' for details

Very Good
Good
Average
Poor
Loose

Montville Township Public Schools
Exhibit D
ECM 4A Building Envelope Improvements
Building Envelope Improvements

Building	Building Envelope Improvements (Y/N)	Envelope Tightness	Cooling Savings Applicable (Y/N)
Cedar Hill Elementary School	Y	Poor	Y
Hilldale Elementary School	Y	Poor	Y
Lazar Middle School	Y	Poor	Y
Montville High School	Y	Poor	Y
Valley View Elementary School	Y	Poor	Y
William Mason Elementary School	Y	Poor	Y
Woodmont Elementary School	Y	Poor	Y
Administration Building	Y	Poor	Y

Montville Township Public Schools
Exhibit D
ECM 4A Building Envelope Improvements
Building Envelope Improvements

CALCULATIONS

	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
Building Envelope Improvements	Y	Y	Y	Y	Y	Y	Y	Y
Envelope Tightness	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor
Tightness Multiplier	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Cooling Savings Applicable	Y	Y	Y	Y	Y	Y	Y	Y
Heating Savings Diversity Factor	80%	80%	80%	80%	50%	80%	80%	80%
Flow Factor	20	20	20	20	20	20	20	20
(AP)^n	5.16	5.16	5.16	5.16	5.16	5.16	5.16	5.16
Crack Area	12.3	3.3	23.5	35.3	21.9	7.8	12.3	0.6
Air Leakage (CFM)	1,269	341	2,425	3,643	2,259	805	1,269	62
Heating Degree Days	4,843	4,843	4,843	4,843	4,843	4,843	4,843	4,843
Heating Efficiency Factor	28,900	28,900	28,900	28,900	28,900	28,900	28,900	28,900
Cooling Savings Diversity Factor	60%	60%	60%	60%	25%	60%	60%	60%
Constant	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
CFM	1,269	341	2,425	3,643	2,259	805	1,269	62
Enthalpy	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Tons	4.7	1.3	8.9	13.4	8.3	3.0	4.7	0.2
Constant	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
CDD	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242
kWh	4,172	1,119	7,970	11,972	3,093	2,645	4,172	203
Therms	1,702	457	3,251	4,884	1,893	1,079	1,702	83
Electric Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%
Thermal Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%
kWh Savings	4,172	1,119	7,970	11,972	3,093	2,645	4,172	203
Thermal Savings	1,702	457	3,251	4,884	1,893	1,079	1,702	83

Montville Township Public Schools
Exhibit D
ECM 5A Solar PPA
Solar PPA Photovoltaic System

ECM DESCRIPTION

Installation of a photovoltaic array utilizing Solar Power Purchase Agreement (PPA) - reducing grid electricity with a reduction of greenhouse gas emissions.

DATA / ASSUMPTIONS

PPA Cost per kWH	**$0.060**
*1-Axis Tracking System Collection Improvement:	**18.6%**

*Emperical studies show an that annual output increases 18.6% with use of one-axis sun tracking
**Assume two weeks of downtime for PV maintenance

Solar radiation at ground level was obtained using the data collected by the National Renewable Energy Laboratory (NREL) via the software Pvwatts.
Proposed technology is only able to convert 77% of the direct current produced at the panel to a usable alternative current for building consumption

MEASUREMENT AND VERIFICATION

Option C - Verification by dedicated electric meter.

COMMISSIONING

Test installed system - measuring the output and verify with calculations for weather conditions. Verify all electrical connections and tie-ins to the grid and the building power.

RECOVERY/SAFETY FACTOR

Safety Factor (Electrical) = **0%**

FORMULAE

$$W_{PV} = \sum_{Jan}^{Dec} (Q_{RAD} \cdot A_{PV} \cdot t_{MONTH}) \cdot t_{\%}$$

Variable	Units	Description
W_{PV}	kWh	Electrical energy produced by PV array
$\sum_{Jan}^{Dec}$	-	Summation of months
Q_{RAD}	$kWh/m^2/day$	Solar radiation (averaged by month) capable of being collected with the proposed PV technology
A_{PV}	ft^2	Area of proposed system
t_{MONTH}	Days	Days in the month
$t_{\%}$	%	Percentage of operational time

Montville Township Public Schools
Exhibit D
ECM 5A Solar PPA
Solar PPA Photovoltaic System

*Inputs are blue

Building	DC Rating of System	Install 1-Axis Tracking System (Y/N)
Cedar Hill Elementary School	81.13	N
Hilldale Elementary School	0.00	N
Lazar Middle School	464.99	N
Montville High School	0.00	N
Valley View Elementary School	246.46	N
William Mason Elementary School	138.54	N
Woodmont Elementary School	0.00	N
Administration Building	0.00	N
Totals	931.1	

Cell ID	Newark		
State	New Jersey		
Latitude	40.7 N		
Longitude	74.17 W		
Month	Days in Month	**Solar Radiation (kWh/day)	Solar Radiation per 1-kW (kWh)
Jan	31	2.39	74.1
Feb	28	3.17	88.8
Mar	31	4.07	126.2
Apr	30	4.83	144.9
May	31	5.7	176.7
Jun	30	5.94	178.2
Jul	31	5.77	178.9
Aug	31	5.38	166.8
Sep	30	4.65	139.5
Oct	31	3.61	111.9
Nov	30	2.35	70.5
Dec	31	2.01	62.3
Total		4.16	**1,518.7**

Montville Township Public Schools
Exhibit D
ECM 6A Cogeneration CHP
Combined Heat and Power Plant

ECM DESCRIPTION

Installation of a Combined Heat and Power Plant (CHP). Recoverable heat from the CHP will be used to subsidize the heating requirements of the swimming pool.

DATA / ASSUMPTIONS

*Annual run hours are agreed upon by facility staff
*Annual waste dump hours are taken at 10% of run time
*CHP Natural Gas Consumption and Recoverable Heat Rate provided by the CHP Manufacturer.
* Parasitic load during normal operation **7%**

MEASUREMENT AND VERIFICATION

Option A (Electric) - The engineering calculations are based on direct kW measurements of the electrical output feed.
Option C (Thermal) - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify electrical and natural gas interconnects, as well as, electrical production by multimeter spot measurements. Verify proper exhaust ventilation.

A safety factor of 0.5 is conservative

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	**50%**
Safety Factor (Thermal) =	**0%**

FORMULAE

$W_{PRODUCTION} = (kW_{CHP} - KW_{PARA}) \cdot t_{CHP}$

$Q_{NET} = (Q_{CHP} - Q_{DISPLACED})$

$Q_{CHP} = Q_D$

$Q_{DISPLACED} = CHP_{NG\text{-}RATE} \cdot (t_{CHP} + t_{DUMP})$

$Q_D = CHP_{NG\text{-}USEABLE} \cdot (CHP_{RECOVERY} / CHP_{NG\text{-}RATE}) \cdot HEATEXG$

$CHP_{NG\text{-}USEABLE} = CHP_{\dagger}$ Building

Label		DHW Quantity	
$	-		0
0		**0**	

Montville Township Public Schools
Exhibit D
ECM 6A Cogeneration CHP
Combined Heat and Power Plant

Variable	Units	0	0
$W_{PRODUCTION}$	kWh/yr	0	0
Q_{NET}	Therms/yr	0	0
$Q_{DISPLACED}$	Therms/yr	0	0
Q_{D}	Therms/yr	Annual CHP Recoverable Heat	
kW_{CHP}	kW	CHP kW	
kW_{PARA}	kW	CHP Parasitic Load	
t_{CHP}	hrs	Annual CHP run time	
t_{DUMP}	hrs	Annual CHP waste heat dump	
Q_{CHP}	therms/yr	Annual Natural Gas Consumption of CHP	
$CHP_{NG-USEABLE}$	therms/yr	Annual useable Natural Gas available for heating purposes	
$CHP_{NG-RATE}$	therms/hr	Natural Gas Consumption rate for the CHP	
$CHP_{RECOVERY}$	therms/hr	Recoverable heat from CHP	
HEATEXG	%	Heat Exchanger Efficiency	
η_{BOILER}	%	Boiler Efficiency	

*Parastic Load, Natural Gas Consumption Rate, and Recoverable Heat Rate based off of Tecogen Literature. If using another manufacturer input fields manually

Building	CHP Plant Electric Output (kW)	Annual Run Hours of Plant	Heat Recovery Efficiency through Heat Exchanger	Parasitic Load* (kW)	Natural Gas Consumption Rate* (therm/hr)	Recoverable Heat Rate* (therm/hr)
Montville High School	10.0	5,590	80%	0.7	1.19	0.5700
				-	-	-
				-	-	-
				-	-	-
				-	-	-
				-	-	-
				-	-	-
Total	**10.0**			0.7		

Montville Township Public Schools
Exhibit D
ECM 6A Cogeneration CHP
Combined Heat and Power Plant

	Montville High School
CHP Plant Electric Output	10.0
Parasitic Load	0.7
Proposed Facility Electric Demand	9.3
Annual hours for CHP Plant	5,590
Annual Waste Heat Dump Hours	**559**
Annual CHP Plant Electric Output	51,987
Natural Gas Consumption Rate	1.2
Annual CHP Plant Natural Gas Consumption	6,652
Recoverable Heat Rate	0.6
Heat Recovery Efficiency through Heat Exchanger	80%
Recoverable CHP Heat Output	2,294
Boiler Efficiency	88.0%
Annual Displaced Natural Gas Consumption	2,607
kW Safety Factor	**0%**
Safety Factor	**0%**
kW Savings / Month	9.3
Annual kWh Production	51,987
Annual Net Thermal Consumption	(4,045)

Montville Township Public Schools
Exhibit D
ECM 7A Permanent Load Reduction
Permanent Load Reduction

ECM DESCRIPTION

PJM Demand Response Program based on Shedable Load on Peak Demand Curtailment Day

DATA / ASSUMPTIONS

Demand Response Revenue	$ 15,000	/ MW
Permanent Load Reduction	$ 31,000	/ MW
Customer Share (Typically between 60-70%)	100%	

Year	All Other $/kW	PSEG $/kW
2017/2018	$22.00	$22.00
2018/2019	$34.00	$34.00
2019/2020	$30.00	$35.00
2020/2021	$25.00	$30.00
	$27.75	$30.25

*Demand Response Savings = Assumed between 1 - 4% Annual Electrical Load
*Assume 2% of Total District Load as Shedable
*Savings is not Guaranteed any savings from program will be considered operational savings only

MEASUREMENT AND VERIFICATION

None - Operational Savings

COMMISSIONING

N/A

RECOVERY/SAFETY FACTOR

N/A

FORMULAE

$$\$_{savings} = kWh_{ADJ} \cdot Cust_{\%} \cdot DM_{\%}$$

Variable	Units	Description
$\$_{savings}$	Dollars	Dollar Savings from Demand Response
$DM_{\%}$	%	Demand Response Savings as a percentage of electric baseline
$Cust_{\%}$	**%**	Customer Percentage of Savings
kWh_{BASE}	kWh	Adjusted Boiler Fuel Usage

Montville Township Public Schools
Exhibit D
ECM 7A Permanent Load Reduction
Permanent Load Reduction

* Inputs are in blue

Building	Demand Response/Permanent Load Reduction Participation (Y/N)
Cedar Hill Elementary School	Y
Hilldale Elementary School	Y
Lazar Middle School	Y
Montville High School	Y
Valley View Elementary School	Y
William Mason Elementary School	Y
Woodmont Elementary School	Y
Administration Building	Y

45%

CALCULATIONS

	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
Demand Response Participation	Y	Y	Y	Y	Y	Y	Y	Y
Average Monthly kW	68	112	245	611	125	67	93	28
Permanent Load Shed Reduction (kW)	22	56	77	144	36	17	18	5
Sheddable Load (kW)								
Percentage of Baseline Demand	32.6%	50.4%	31.4%	23.6%	28.6%	25.4%	19.6%	17.3%
Demand Response $ / MW	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
Permanent Load Shed Reduction $ / MW	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000
Demand Hours / Year	100	$ -						
Cost to Run Generator / hr	$ -	$ -						
Cost to Run Generator / yr	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%
DR and PLR Savings	$ 692	$ 1,747	$ 2,382	$ 4,477	$ 1,111	$ 525	$ 564	$ 148
Net Demand Response Savings	$ 692	$ 1,747	$ 2,382	$ 4,477	$ 1,111	$ 525	$ 564	$ 148

Montville Township Public Schools
Exhibit D
ECM 8A Computer Power Management
Computer Power Management

ECM DESCRIPTION

Install a centralized personal computer power management system to control computers and monitors.

DATA / ASSUMPTIONS

* Annual Savings for Student Computers	120	kWh/Yr
* Annual Savings for Administrative Computers	110	kWh/Yr

	On		Sleep Mode	
* CRT wattage (Average)	70	W	15	W
* LCD wattage	18	W	5	W

Annual Savings for Administrative Computers and Student Computers are based on previous logging results for computers with similar usage types

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and post software installation computers. All existing computers will be measured before the installation of the computer management software.

COMMISSIONING

Review installation documents for alignments and vibrations. Start up equipment and measure vibration through the load range along with motor kW. Verify that VFDs are capable of operating in full design range upon the control signal demand.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

The safety factor for this ECM is taken at 0 due to some variability in schedule and load changes.

FORMULAE

$W_{TOTAL} = (W_{CPU} \cdot CPU_{\#}) + (W_{LCD} \cdot CRT_{\#})$

$W_{LCD} = (CRT_{\#} \cdot Monitor_{hrs\text{-}SLEEP} \cdot (W_{CRT\text{-}SLEEP} - W_{LCD\text{-}SLEEP}) \cdot Monitor_{\%OFF}) + (CRT_{\#} \cdot Monitor_{hrs\text{-}ON} \cdot (W_{CRT\text{-}ON} - W_{LCD\text{-}ON}))$

Montville Township Public Schools
Exhibit D
ECM 8A Computer Power Management
Computer Power Management

Variable	Units	Description	
W_{TOTAL}	kWh	Total Electrical Savings associated with this measure	
W_{CPU}	kWh	Electrical Savings associated with computer control	
W_{LCD}	kWh	Electrical Savings associated with Monitor Replacement	
$CPU_{\#}$	-	Numbers of Computers	
$CRT_{\#}$	-	Numbers of CRTs	
$W_{CRT\text{-}ON}$	Building	Label	DHW Quantity
$W_{CRT\text{-}SLEEP}$	kWh	0	0
$W_{LCD\text{-}ON}$	kWh	0	0
$W_{LCD\text{-}SLEEP}$	kWh	0	0
$Monitor_{hrs\text{-}ON}$	hrs	0	0
$Monitor_{hrs\text{-}SLEEP}$	hrs	0	0
$Monitor_{\%OFF}$	%	0	0

* Inputs are in blue

Building	# of Student Computers	# of Administrative Computers	# of CRTs to be Replaced
Cedar Hill Elementary School	95		
Hilldale Elementary School	76		
Lazar Middle School	193		
Montville High School	300		
Valley View Elementary School	101		
William Mason Elementary School	81		
Woodmont Elementary School	93		
Administration Building		41	
Totals	939	41	0

CALCULATIONS

	Cedar Hill Elementary School	Hilldale Elementary School	Lazar Middle School	Montville High School	Valley View Elementary School	William Mason Elementary School	Woodmont Elementary School	Administration Building
Number of Student Computers	95	76	193	300	101	81	93	-
Number of Administrative Computers	-	-	-	-	-	-	-	41
Total Number of Computers	95	76	193	300	101	81	93	41
Number of CRTs to be Replaced	-	-	-	-	-	-	-	-
Monitor On Run Hours	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080
Monitor Sleep Mode Run Hours	3,240	3,240	3,240	3,240	3,240	3,240	3,240	3,240
Percentage of Monitors Turned off during Unoccupied Hours	65%	65%	65%	65%	65%	65%	65%	65%
kWh Savings (Monitor)	-	-	-	-	-	-	-	-
kWh Savings (Computers)	11,400	9,120	23,160	36,000	12,120	9,720	11,160	4,510
kWh Savings	11,400	9,120	23,160	36,000	12,120	9,720	11,160	4,510
Recovery Factor	90%	90%	90%	90%	90%	90%	90%	90%
kWh Savings	10,260	8,208	20,844	32,400	10,908	8,748	10,044	4,059

APPENDIX 3 CUTSHEETS

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Building Sealant Recommendations and Surface Preparation Guide for Weatherseal Applications

Weatherseal

Dow Corning has a full line of high-performance primers for sealants. Primers are used to enhance adhesion.

	Dow Corning® 756 SMS Building Sealant	*Dow Corning*® 790 Silicone Building Sealant[1]	*Dow Corning*® 791 Silicone Weatherproofing Sealant	*Dow Corning*® 795 Silicone Building Sealant
Substrate	**Surface Prep**			
Concrete and Masonry				
Brick	Limited Data/Field Test	No Primer	1200 OS/Primer P	Primer P
Concrete	Field Test	No Primer	1200 OS/Primer P	Primer P
Mortar	Primer P	No Primer	Primer P	Primer P
EIFS[2]				
All Manufacturers[3]	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Stone				
Granite	No Primer	No Primer	Limited Data/Field Test	1200 OS/Primer P
Travertine	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Marble[4]	1200 OS/Primer P	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Limestone[8]	1200 OS/Primer P	Limited Data/Field Test	Limited Data/Field Test	Primer P
(Natural Stone) Sandstone[9]	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Primer P
Paints				
Acrylic Latex	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Duracron	No Primer	Limited Data/Field Test	No Primer	1200 OS/Primer P
Polyester Powder Coating[7]	Limited Data/Field Test	1200 OS	No Primer	No Primer
Polyurethane	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Polyvinyl Chloride (PVC)	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Fluoropolymer				
Kynar®	No Primer	Limited Data/Field Test	No Primer	Primer-C OS
Duranar®	No Primer	Limited Data/Field Test	No Primer	Primer-C OS
Duranar Sunstorm®	Limited Data/Field Test	Limited Data/Field Test	No Primer	Primer-C OS
Fluropon®	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Primer-C OS
Metals				
Aluminum – Chromate Conversion, Alodine®	No Primer	Limited Data/Field Test	No Primer	No Primer
Aluminum – Mill Finish	No Primer	1200 OS	1200 OS	1200 OS
Aluminum – Anodized	No Primer	1200 OS	No Primer	No Primer
Copper	Do Not Use	Do Not Use	No Primer	No Primer
Lead	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test

	Dow Corning® 756 SMS Building Sealant	*Dow Corning*® 790 Silicone Building Sealant[1]	*Dow Corning*® 791 Silicone Weatherproofing Sealant	*Dow Corning*® 795 Silicone Building Sealant
Substrate	**Surface Prep**			
Glass[6]				
Coated Glass	No Primer	1200 OS	No Primer	No Primer
Clear Glass	No Primer	No Primer	No Primer	No Primer
Steel				
Red Lead Primer	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Weathered	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Stainless	Limited Data/Field Test	Limited Data/Field Test	1200 OS	1200 OS
Galvanized	No Primer	1200 OS	No Primer	1200 OS/Primer P
Cold Rolled	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test	Limited Data/Field Test
Plastics				
PVC	Limited Data/Field Test	Limited Data/Field Test	1200 OS/Primer P	No Primer
Acrylic	Limited Data/Field Test	Do Not Use	Limited Data/Field Test	Limited Data/Field Test
Polycarbonate	Do Not Use	Do Not Use	Limited Data/Field Test	Limited Data/Field Test

Key: 1200 OS: *Dow Corning*® 1200 OS Primer; PC: *Dow Corning*® Primer-C OS; PP: *Dow Corning*® Primer P; NA: Not applicable
Dow Corning must test all materials for adhesion in structural applications.
Field adhesion tests must be performed at the jobsite to verify sealant adhesion.

[1] When using a primer with *Dow Corning*® 790 Silicone Building Sealant, apply the primer before installing backer rod and allow the primer to dry. Cold weather and porous surfaces require additional drying time.
[2] Do not apply sealant to EIFS finish coat unless approved by EIFS manufacturer.
[3] Cleaning procedures for EIFS systems should be followed.
[4] The extremely porous nature of some marble, particularly white marble, can contribute to the potential for fluid migration into this substrate. Contact a Dow Corning Specialist when working with marble.
[5] Laminated glass with polyvinyl buyvol (PVB) interlayer may delaminate up to 1/4” at the edges when in contact with a sealant.
[6] Do not use *Dow Corning*® 790 Silicone Building Sealant on copper sputter coated glass.
[7] See *Organic Solvent Usage* in the *Dow Corning Americas Technical Manual* (62-1112) for comment.
[8] Some limestone and other porous stone substrates contain iron and other impurities that can interact with *Dow Corning*® 756 SMS Building Sealant, causing discoloration of the sealant and/or substrate. Prior to use, *Dow Corning*® 756 SMS Building Sealant should be tested for compatibility with these substrates using water immersion.

This surface preparation guide is intended to aid in proper selection of surface preparation techniques and primers, if necessary, to gain adhesion that meets Dow Corning’s requirements. The suggestions in this guide are not blanket-approval recommendations; Dow Corning requires all surface prep recommendations in this guide be verified by field or shop adhesion testing and documented prior to starting the project for each substrate/sealant combination. Failure to verify and document adhesion results may result in adhesion loss that is not covered by the Dow Corning Warranty. Recommendations in this guide have been shown to be the best overall recommendations but do not cover every substrate for each material type or finish listed in this guide. Additionally, substrate manufacturers should be contacted to obtain recommendations for proper cleaning solvents for use with their materials. The entire *Weatherproofing* section of the *Dow Corning Americas Technical Manual*, Form No. 62-1112, should be read and understood before proceeding with the evaluations. The following sections within the manual must be followed to verify and document adhesion:

- *Substrate Cleaning Procedure*
- *“Two Cloth” Cleaning Method*
- *Primer Application Procedure*
- *Field Adhesion Testing Procedure*
- *Field Adhesion Hand Pull Test Criteria*
- *Field/Shop Adhesion Log and Sealant Quality Control Logs*

Structural

All structural applications must be tested by the Dow Corning test lab.

	Dow Corning® 795 Silicone Building Sealant	*Dow Corning*® 983 Structural Glazing Sealant	*Dow Corning*® 995 Silicone Structural Sealant	*Dow Corning*® 121 Structural Glazing Sealant
Substrate	**Surface Prep**			
Paints				
Acrylic Latex	Limited Data/Lab Test	Limited Data/Lab Test	Limited Data/Lab Test	Limited Data/Lab Test
Duracron	Primer-C OS	Primer-C OS	Primer-C OS	Primer-C OS
Polyester Powder Coating[1]	Primer-C OS, 1200 OS	Primer-C OS, 1200 OS	No Primer	Primer-C OS
Fluoropolymer				
Kynar®	Primer-C OS	Primer-C OS, 1200 OS	No Primer	Primer-C OS
Duranar®	Primer-C OS	Primer-C OS	Primer-C OS	Primer-C OS
Duranar Sunstorm®	Primer-C OS	Primer-C OS	Primer-C OS	Limited Data/Lab Test
Fluropon®	Primer-C OS	Primer-C OS	Primer-C OS	Limited Data/Lab Test
Metals				
Aluminum – Chromate Conversion, Alodine®	No Primer, 1200 OS	No Primer, 1200 OS	1200 OS	1200 OS
Aluminum – Anodized	No Primer	No Primer, 1200 OS	1200 OS	1200 OS
Glass – Surface to be Glazed to				
Clear	No Primer	No Primer	No Primer	No Primer
Float	No Primer	No Primer	No Primer	No Primer
Laminated[2]	No Primer	No Primer	No Primer	No Primer
Plate	No Primer	No Primer	No Primer	No Primer
Tinted	No Primer	No Primer	No Primer	No Primer
Ceramic Frit Coating	No Primer	No Primer	No Primer	No Primer
Reflective Glass	No Primer	No Primer	No Primer	No Primer
Low E High (T) Glass	No Primer	No Primer	No Primer	No Primer

Key: 1200 OS: *Dow Corning*® 1200 OS Primer; PC: *Dow Corning*® Primer-C OS; PP: *Dow Corning*® Primer P; NA: Not applicable
Dow Corning must test all materials for adhesion in structural applications.
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[1] See *Organic Solvent Usage* in the *Dow Corning Americas Technical Manual* (62-1112) for comment.
[2] Laminated glass with polyvinyl buyvol (PVB) interlayer may delaminate up to 1/4” at the edges when in contact with a sealant.

This surface preparation guide is intended to aid in proper selection of surface preparation techniques and primers, if necessary, to gain adhesion that meets Dow Corning’s requirements. The suggestions in this guide are not blanket-approval recommendations; Dow Corning requires all surface prep recommendations in this guide be verified by field or shop adhesion testing and documented prior to starting the project for each substrate/sealant combination. Failure to verify and document adhesion results may result in adhesion loss that is not covered by the Dow Corning Warranty. Recommendations in this guide have been shown to be the best overall recommendations but do not cover every substrate for each material type or finish listed in this guide. Additionally, substrate manufacturers should be contacted to obtain recommendations for proper cleaning solvents for use with their materials. The entire *Weatherproofing* section of the *Dow Corning Americas Technical Manual*, Form No. 62-1112, should be read and understood before proceeding with the evaluations. The following sections within the manual must be followed to verify and document adhesion:

- *Substrate Cleaning Procedure*
- *“Two Cloth” Cleaning Method*
- *Primer Application Procedure*

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that our products are safe, effective and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

Dow Corning's sole warranty is that our products will meet the sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

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DOW CORNING

We help you invent the future.™

A smart way to save on your commercial refrigeration costs.

ENERGY STAR PARTNER

IntelliCon®-RU

Commercial Refrigeration Unit Electrical Consumption Economizer

The IntelliCon®-RU will reduce electric consumption—typically 10% to 20%—when installed on commercial refrigeration/freezer (refrigeration) systems. IntelliCon-RU using intelligent Dynamic Cycle Management (DCM) Technology represents a major advancement in refrigeration system energy-saving technology, unsurpassed in today's commercial refrigeration marketplace. IntelliCon-RU is easily installed by a qualified installer, maintenance free and guaranteed to save energy.

Features

- Dynamic Cycle Management (DCM) Technology reduces air conditioning electric consumption—typically 10% to 20%
- UL listed, "Energy Management Equipment"
- Increased savings without replacing or upgrading costly system components
- "State-of-the-art" microprocessor-based control—LED indicators show operating modes
- Compatible with Intellidyne System 12
- Protects compressor against momentary power outages and short cycling
- Simple installation by a qualified HVAC/R installer
- No programming or follow-up visits required
- Maximum year-round efficiency
- Reduces maintenance and extends compressor life
- Fail-safe operation
- Guaranteed to save energy
- 15-year replacement warranty for breakdowns or defects

303 Sunnyside Boulevard, Suite 75, Plainview, NY 11803-1508, USA
Telephone: (516) 676-0777 • Toll Free: (866) 216-0777 • Fax: (516) 676-2640
www.intellidynellc.com

Intellidyne®

FEATURING DCM TECHNOLOGY

IntelliCon®-RU

Commercial Refrigeration Unit Electrical Consumption Economizer

Specifications

Mounting:
Any position via molded-on 1/2" Electrical Fitting

Size:
4"H x 4" W x 2 1/2"D

Operating Humidity:
5% - 95% Non-Condensing

Operating Temperature Range:
-10°F - +120°F

Power Input:
24/115/220 VAC @ 5W

Control Circuit:
24 VAC/DC, 115/220 VAC

Relay Contact:
10A @ 220VAC General Purpose

UL Listed,
"Energy Management Equipment"

Made in U.S.A.

The *IntelliCon®-RU* is a microprocessor-based, UL listed, electronic control that automatically adjusts the compressor cycles to achieve the greatest efficiency and reduced electrical usage. The sizing of refrigeration systems is based upon a number of factors. When any of the design considerations are not met, the refrigeration system can become oversized for the load and thus less efficient.

Intellidyne's intelligent Dynamic Cycle Management (DCM) Technology analyzes the demands and thermal characteristics of the entire refrigeration system, and dynamically modifies the compressor cycle pattern. These new patterns result in less frequent and more efficient compressor cycles. Just as computer control has increased the gas mileage of automobiles, *IntelliCon-RU* improves the electrical efficiency of refrigeration systems, by supplementing the antiquated on/off action of the thermostat or pressuretrol with the analysis and control capabilities of a computer.

The *IntelliCon* DCM Technology "intelligent modification of compressor cycling" will result in significant electrical energy savings. *IntelliCon's* innovative and intelligent algorithms have field proven electrical savings not only on properly sized and operating systems, but also on units that were undersized or those that had not been properly maintained.

The *IntelliCon-RU* works in conjunction with the existing temperature controls and will not void the compressor manufacturer's warranty. An additional feature of the *IntelliCon-RU* is the accepted industry practice of compressor anti-short-cycling control.

Installation by a qualified HVAC/R service technician is recommended. The *IntelliCon-RU* does not require any programming, adjustments or maintenance.

commercial economizers

303 Sunnyside Boulevard, Suite 75, Plainview, NY 11803-1508, USA
Telephone: (516) 676-0777 • Toll Free: (866) 216-0777 • Fax: (516) 676-2640
www.intellidynellc.com

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Verdiem®
by Aptean

The Leader In IT Energy Managment and Efficiency

TAKE CONTROL OF YOUR PC & PRINTER FLEETS

Verdiem uniquely monitors end user computing and print devices and provides IT with actionable data to increase efficiency and reduce costs, 30% or more. Verdiem also delivers a 90%+ success rate in waking up PCs for patches and other software updates.

GUARANTEED SOFTWARE UPDATE SUCCESS

- Enhanced Wake-on-LAN that requires no router or security changes
- Automatically elects proxies across all subnets
- Integrates with SCCM, automatically monitoring for advertisements
- Overcome Windows sleep disorders, ensuring PCs will properly wake-up, sleep, or shutdown
- Run system maintenance applications and reboot systems from a central console
- Automate custom processes when systems wake or before being put to sleep
- Report system health information

END USER PRINT OPTIMIZATION

- Inventory of printer makes and models
- Print volumes by department, location, users, and printer model
- Prescriptive guidance & cost savings on printers via elimination /shift to lower cost printers

"…if you're a Microsoft shop and you use Active Directory and Configuration Manager for deployments, Verdiem integrates both components seamlessly and we were extremely impressed with how we could leverage our existing implementations of both Active Directory and System Center Configuration Manager to deploy and then manage Verdiem."

"…because Verdiem allows us to remotely wake PCs with a simple website, we've actually solved a major help desk and support problem that we've had. People are actually able to turn their PCs on from home remotely and then able to do work off-line off-hours. So that was a very unforeseen benefit."

- Ryan Harvey,
Manager Design & IT,
University of Pittsburgh Medical Center

Verdiem®
by Aptean

The Leader In IT Energy Managment and Efficiency

BASIC PC POWER MANAGEMENT CAPABILITIES	SCCM '12	VERDIEM
Centralized Control and Administration	✓	✓
Collection-based Policies	✓	✓
Support for Simple Power Policies	✓	✓
Basic Usage and Savings Reporting	✓	✓
Support for Windows (XP, Vista, Windows 7 & 8)	✓	✓
Sleep, Hibernate, Shutdown	✓	✓
Display Standby	✓	✓
Active Directory Integration	✓	✓

REQUIRED ENTERPRISE CAPABILITIES	SCCM '12	VERDIEM
Proven Network Proxy Driven Wake-On-WAN		✓
Supports Wake-on-Web for Remote User Access		✓
Print Resource Analytics		✓
Auto Synchronization of Wake and Updating		✓
One-Click PC Sleep Disorder Resolution		✓
Real-time Control of PC Power States		✓
Executive-Level Sustainability Dashboard		✓
Multiple Intraday Power Policies		✓
Graceful Shutdown of Open Applications/Data		✓
Historical Data Retention and Advanced Reporting		✓
Support for Mac OS		✓
API Driven Tools for Enterprise Automation		✓
Location-based Utility Rate Driven Reporting		✓
Support wake-up for 802.1X networks		✓
Identifies wasted/unused systems with analytics		✓

Verdiem®
by Aptean

EFFICIENCY, SAVINGS AND CONTROL

The clear and practical choice for enterprise wake and PC power management.

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Verdiem is a registered trademark of Aptean Systems, LLC.

Aptean Verdiem Surveyor

Power Management for Microsoft and Mac

As a power management solution for PCs, Macs, and Windows tablets, Aptean Verdiem Surveyor provides a unified approach for IT device data collection, policy management, administration, and analytics. Surveyor offers the most accurate approach to energy management and measurement and can reduce your IT energy costs up to 60%.

Optimize Savings and Improve Energy Efficiency

Surveyor helps accurately measure computer and tablet energy consumption, allowing you to enforce policies for greater energy efficiency and optimize savings.

Surveyor delivers three IT efficiency solutions in a single integrated product:

- **PC Power Management** – Reducing PC energy usage starts with establishing a baseline of current energy usage data. Surveyor automatically detects and groups devices to capture accurate energy usage data and leverages the data to reduce power consumption.
- **Enterprise PC Wake** – Surveyor reliably wakes the PC fleet for security updates and patch management.
- **End User Print Analytics** – Uniquely monitor end user print activity and compile actionable data for devices and the people who use them.

Learn More

To learn more, contact your Account Manager or email us at **info@aptean.com**.

Benefits

- Improve security and compliance by achieving 95%+ wake success for patching
- Increase energy savings by an additional 30-60%
- Reduce IT labor and costs
- Streamline the administration of endpoint devices
- Enhance analytics capabilities with exhaustive reports that use the very detailed data collected on energy usage, savings opportunities and underutilized devices

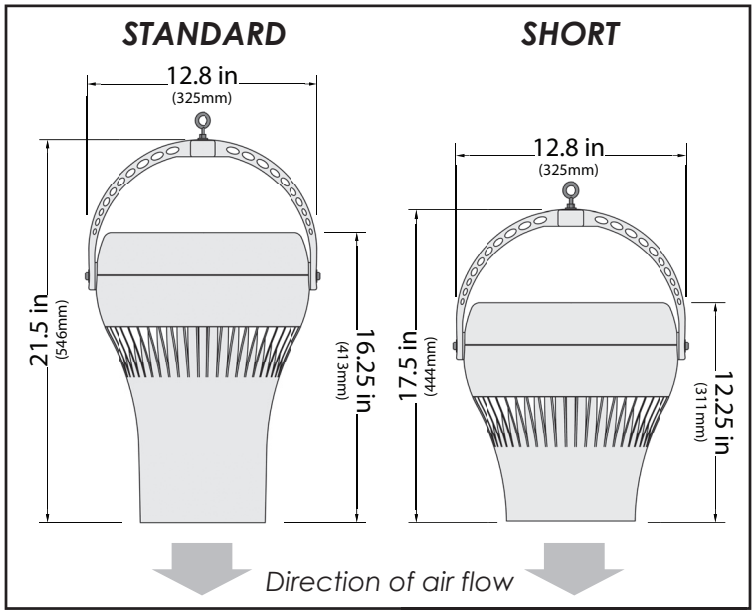
AIR PEAR 25-SP DESTRATIFICATION FAN SUBMITTAL

SPECIFICATION SECTION: 23 34 00 - HVAC FANS

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	**dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
A-25-SP	120	50/60	0.30/0.32	30/35	1500/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-SP	230	50/60	0.14/0.13	31/33	1450/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-SP	277	50/60	0.13/0.17	35/45	1500/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²

**0-static motor data supplied by fan manufacturer. Subject to change at any time.*

***Sound pressure level at 3 feet. Sound Power Level 58 dB(A), designed to meet ISO 3744 – engineering grade precision for determining sound power.*



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	25	SP (Shaded Pole)	(Short) SH (Standard) STD	120 230 277	(Off White) W (Gray) G (Black) B

EXAMPLE: A - 25 - SP - **STD - 120 - W**

- **Color**
- **Voltage (AC)**
- **Nozzle Length**
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season.

CERTIFICATION: *Conforms to UL-507, CAN/CSA C22.2#60335-1, UL 94 5VA and is ETL listed in USA and Canada.*

HOUSING: *PC/ABS resin, 5VA flame resistance rating*

MOTOR: *Single phase, shaded pole, single speed (variable with optional speed control), axial motor. Motor is thermally protected. Operating temperature: -4˚ F (-20˚ C) to 158˚ F (70˚ C). No lubrication required. Bearings are sealed. 6' cord and plug provided for 120V, no plug for 230V.*

STATOR: *Patented multi-vane stator significantly increases air throw for maximizing performance. PC/ABS.*

SAFETY CABLE: *6' length steel cable (fastened to body)*

WARRANTY*: Warranty - 3-years parts and workmanship. Money back guarantee - 30 days. Refurbish program after 3-year warranty period.*

FACTORY INSTALLED OPTIONS:

Item #	Description	Qty
PHI-9-C	Factory installed 9 in. PHI cell	
PHI-5-C	Factory installed 5 in. PHI cell	
GUARD25	Silver intake grille	

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

Item #	Description	Qty
TRIAC-120-1.5	120VAC, 1.5A wall mounted speed control	
TRIAC-120-5	120VAC, 5A wall mounted speed control	
TRIAC-120-15	120VAC, 15A wall mounted speed control	
TRIAC-230-8	230VAC, 8A wall mounted speed control	
TRIAC-277-5	277VAC, 5A wall mounted speed control	
TRIAC-SMART-7.5	95-250VAC, 7.5A, electrical box speed control	

COLOR OPTIONS:

"Off White" Cool Gray 2C *"Gray" Gray 432C* *Black*

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811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@airiusfans.com, www.airiusfans.com

May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

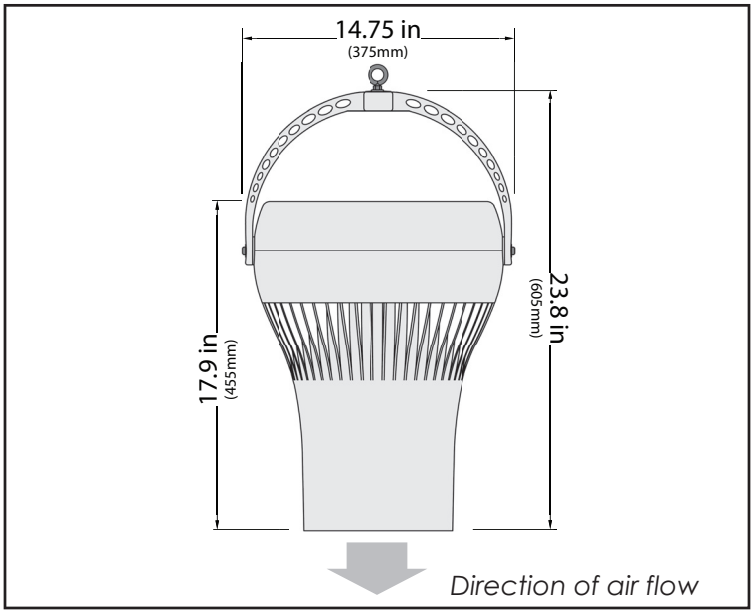
AIR PEAR 45-P4 DESTRATIFICATION FAN SUBMITTAL

SPECIFICATION SECTION: 23 34 00 - HVAC FANS

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	**dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
A-45-P4	120	50/60	0.40/0.41	44/46	1400/1650	595/715	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P4	230	50/60	0.19/0.2	42/45	1450/1630	595/707	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P4	277	50/60	0.19/0.2	42/45	1450/1630	595/707	54	14 lb	Up to 38 ft.	Up to 1200 ft²

*0-static motor data supplied by fan manufacturer. Subject to change at any time.

**Sound pressure level at 3 feet. Sound Power Level 66 dB(A), designed to meet ISO 3744 – engineering grade precision for determining sound power.



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	45	P4 (permanent split capacitor)	(Standard) STD	**120** **230** **277**	**(Off White) W** **(Gray) G** **(Black) B**

EXAMPLE: A - 45 - P4 - STD - **120 - W**

- **Color**
- **Voltage (AC)**
- Nozzle Length
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season.

CERTIFICATION: *Conforms to UL-507, CAN/CSA C22.2#60335-1, UL 94 5VA and is ETL listed in USA and Canada.*

HOUSING: *PC/ABS resin, 5VA flame resistance rating*

MOTOR: *Permanent Split Capacitor, single speed (variable with optional speed control), axial motor. Motor is thermally protected. Operating temperature: -13˚ F (-25˚ C) to 158˚ F (70˚ C). No lubrication required. Bearings are sealed. 6' cord and plug provided for 120V, no plug for 230/277V*

GUARD GRILLE: *Steel, phosphated and coated in black plastic*

STATOR: *Patented multi-vane stator significantly increases air throw for maximizing performance. PC/ABS.*

SAFETY CABLE: *6' length steel cable (fastened to body)*

WARRANTY*: Warranty - 3-years parts and workmanship. Money back guarantee - 30 days. Refurbish program after 3-year warranty period.*

FACTORY INSTALLED OPTIONS:

Item #	Description	Qty
PHI-9-C	Factory installed 9 in. PHI cell	

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

Item #	Description	Qty
TRIAC-120-1.5	120VAC, 1.5A wall mounted speed control	
TRIAC-120-5	120VAC, 5A wall mounted speed control	
TRIAC-120-15	120VAC, 15A wall mounted speed control	
TRIAC-230-8	230VAC, 8A wall mounted speed control	
TRIAC-277-5	277VAC, 5A wall mounted speed control	
TRIAC-SMART-7.5	95-250VAC, 7.5A, electrical box speed control	

COLOR OPTIONS:

"Off White" Cool Gray 2C — "Gray" Gray 432C — Black

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May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

Commercial Gas Water Heaters

CYCLONE® Mxi MODULATING

MODULATING BURNER ADVANCES THE CYCLONE TO HIGHER LEVELS OF EFFICIENCY

The full line of A. O. Smith Cyclone Mxi condensing water heaters has been designed to provide years of dependable service and feature industry leading technology. Models are available from 120,000 to 500,000 Btu/h and all deliver thermal efficiencies of 95% and higher. The unique helical coil heat exchanger limits weld joints for optimal service life while maximizing heat transfer.

Cyclone is the industry leader in high efficiency commercial water heating. The current Mxi modulating models adjust firing rate to the specific demand further increasing efficiency and money savings.

INTELLIGENT CONTROL SYSTEM WITH LCD DISPLAY AND iCOMM CONNECTIVITY

- Exclusive A. O. Smith designed touch display control system
- Provides detailed water heater status information
- Precise temperature control adjustable from 90 to 180 degrees
- Built-in diagnostics
- Run history information
- Cyclone® Mxi Modulating water heaters are compatible with the iCOMM™ remote monitoring system. Call 1.888.928.3702 for information.

COMING SPRING 2017

- Remote monitoring capability utilizing the iCOMM app. Wi-Fi connectivity kit requited for models 120-250, standard on models 300-500.

SUBMERGED COMBUSTION CHAMBER, WITH HELICAL HEAT EXCHANGER COIL

- Positioned in center of tank, surrounded by water to virtually eliminate radiant heat loss from chamber
- Direct spark ignition
- Spiral heat exchanger keeps hot burner gases swirling, uses centrifugal force to maximize efficiency of heat transfer to water in tank
- Spiral heat exchanger reduces lime scale from forming on water-side surfaces, which maintains energy efficiency over time

POWERED ANODES STANDARD ON ALL MODELS

- Provides long-lasting tank protection in varying water conditions
- Powered anodes are non-sacrificial
- Automatically adjusts output needed to properly protect the tank

PERMAGLAS® ULTRA COAT™ GLASS LINING

- Glass coating is applied using a liquid slush coating technique to ensure uniform coating
- Heat exchanger coil is glassed both externally and internally for optimum protection

MECHANICAL VENTING VERSATILITY

- Conventional power venting or direct venting
- Vents vertically or through a sidewall
- Front located exhaust and condensate connections allow for easy install and access
- Vents with low cost PVC Schedule 40 intake and exhaust pipe. Approved for optional CPVC Schedule 40, Polypropylene and AL29-4C stainless steel vent materials
- Direct-vent intake and exhaust pipe can terminate separately outside building or through single opening, using concentric vent assembly
- Canadian installations require ULC S636 PVC/ CPVC, ULC S636 Polypropylene and AL29-4C stainless steel pipe for intake and exhaust

HIGH EFFICIENCY MODULATING PRE-MIX POWERED BURNER

- Down-fired pre-mix burner provides optimum efficiency and quiet operation
- Top-mounted burner position prevents condensation from affecting burner operation

3-YEAR LIMITED TANK / 1-YEAR LIMITED PARTS WARRANTY

- For complete warranty information, consult written warranty or go to hotwater.com.

BTH-120(A) THROUGH BTH-500(A)
MODEL SHOWN:
BTH-199(A) SERIES 300/301

Low Lead Content · ENERGY STAR · CERTIFIED WATER QUALITY · ASME HLW · GAS-FIRED c UL us LISTED · iCOMM · AHRI CERTIFIED www.ahridirectory.org · ASME (Optional)

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www.hotwater.com | 800-527-1953 Toll-Free USA | A. O. Smith Corporation | 500 Tennessee Waltz Parkway | Ashland City, TN 37015

OTHER FEATURES:

SPACE-SAVING DESIGN FOR INSTALLATION FLEXIBILITY

- Easy-to-remove top cover for convenient access to serviceable parts
- 0″ installation clearances on sides and rear, 1-1/2″ installation clearance on top
- Handhole cleanout allows easy access to tank interior for cleaning
- 0″ clearance to combustibles, approved for installation on combustible floors

CODES AND STANDARDS

- CSA certified and ASME rated T&P relief valve
- Maximum hydrostatic working pressure: 160 psi
- All models are design certified by Underwriters Laboratories (UL), Inc., to ANSI Z21.10.3 - CSA 4.3 Standards
- Meets the thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition ASHRAE/IES 90.1
- Design Certified by Underwriters Laboratories to NSF standard 5 for 180°F (62°C) water
- Complies with SCAQMD Rule 1146.2 and other Air Quality Management Districts with similar requirements for ultra low-NOx emissions
- ASME tank construction optional on 120-500 model sizes

VENT REQUIREMENTS FOR BTH 120(A) - 250(A)

Number of 90° Elbows Installed	3 Inch Pipe	4 Inch Pipe
	Maximum Feet (Meters)	Maximum Feet (Meters)
One (1)	45 feet (13.7 meters)	115 feet (35 meters)
Two (2)	40 feet (12.2 meters)	110 feet (33.5 meters)
Three (3)	35 feet (10.7 meters)	105 feet (32 meters)
Four (4)	30 feet (9.1 meters)	100 feet (30.5 meters)
Five (5)	N/A	95 feet (29 meters)
Six (6)	N/A	90 feet (27.4 meters)

VENT REQUIREMENTS FOR BTH 300(A) - 500(A)

Number of 90° Elbows Installed	4 Inch Pipe	6 Inch Pipe
	Maximum Feet (Meters)	Maximum Feet (Meters)
One (1)	65 feet (19.8 meters)	115 feet (35 meters)
Two (2)	60 feet (18.2 meters)	110 feet (33.5 meters)
Three (3)	55 feet (16.8 meters)	105 feet (32 meters)
Four (4)	50 feet (15.2 meters)	100 feet (30.5 meters)
Five (5)	45 feet (13.7 meters)	95 feet (29 meters)
Six (6)	40 feet (12.2 meters)	90 feet (27.4 meters)

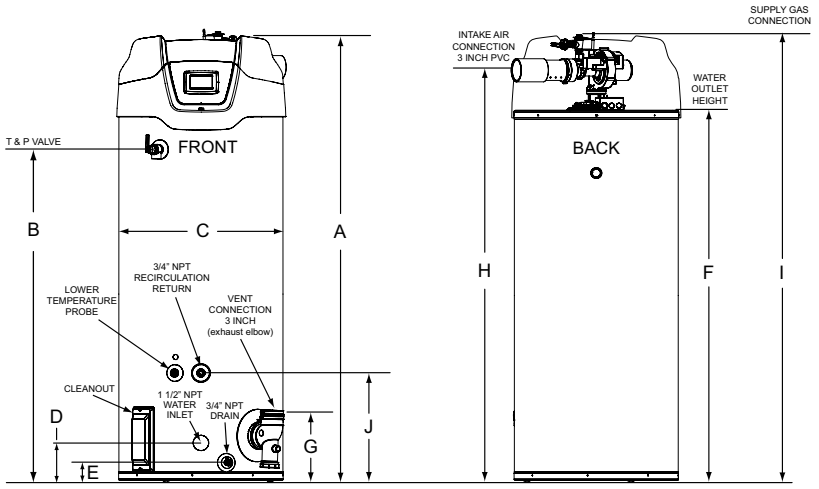
GAS PRESSURE REQUIREMENTS

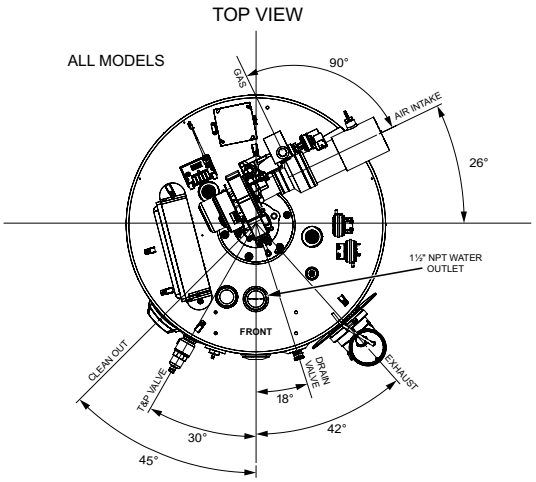
Model Number	Manifold Pressure		Minimum Supply Pressure		Maximum Supply Pressure	
	Natural Gas	Propane Gas	Natural Gas	Propane Gas	Natural Gas	Propane Gas
BTH-120(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	3.5"W.C. (1.10 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)
BTH-150(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	3.5"W.C. (1.10 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)
BTH-199(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	3.5"W.C. (1.10 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)
BTH-250(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	3.5"W.C. (1.10 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)
BTH-300(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	4.8"W.C. (1.19 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)
BTH-400(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	4.8"W.C. (1.19 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)
BTH-500(A)	0"W.C. (0 kPa)	0"W.C. (0 kPa)	4.8"W.C. (1.19 kPa)	8.5"W.C. (2.12 kPa)	14"W.C. (3.49 kPa)	14"W.C. (3.49 kPa)

Depending on the installed equivalent length, and/or the number of appliances connected, the supply gas line size may need to be increased beyond the minimum required size.

Commercial Gas Water Heaters

BTH 120-250





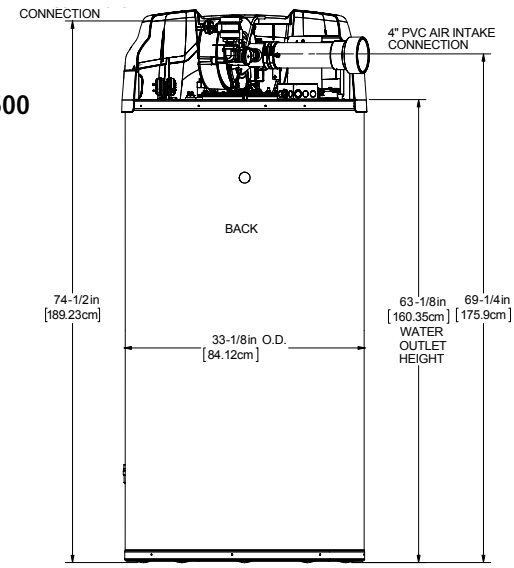
* Center line of water outlet on top of the water heaters is approximately 7 inches from the front edge of the water heater

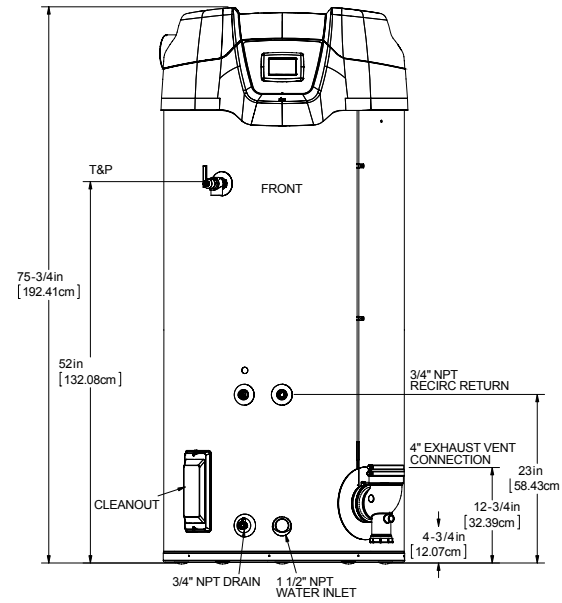
Model Number	Approx. Capacity		Dimensions										lb/kg	Approx. Shipping Weight Std	Approx. Shipping Weight ASME
			A	B	C	D	E	F	G	H	I	J			
BTH-120(A)	Gallons	60	55 1/2	35	27 3/4	6 5/16	3	42 1/4	11 1/4	48 1/2	53 1/2	18 1/4	lb	460	490
	Liters	227	141	88.9	70.5	16	7.62	107.32	28.6	123.2	135.9	46.36	kg	208	220
BTH-150(A)	Gallons	100	76 1/2	56 3/8	27 3/4	6 5/16	3	64	11 1/4	70	75 1/2	18 1/4	lb	523	553
	Liters	379	194.9	143.2	70.5	16	7.62	162.6	28.6	177.8	191.8	46.36	kg	237	251
BTH-199(A)	Gallons	100	76 1/2	56 3/8	27 3/4	6 5/16	3	64	11 1/4	70	75 1/2	18 1/4	lb	523	553
	Liters	379	194.9	143.2	70.5	16	7.62	162.6	28.6	177.8	191.8	46.36	kg	237	251
BTH-250(A)	Gallons	100	76 1/2	56 3/8	27 3/4	6 5/16	3	64	11 1/4	70	75 1/2	18 1/4	lb	523	553
	Liters	379	194.9	143.2	70.5	16	7.62	162.6	28.6	177.8	191.8	46.36	kg	237	251

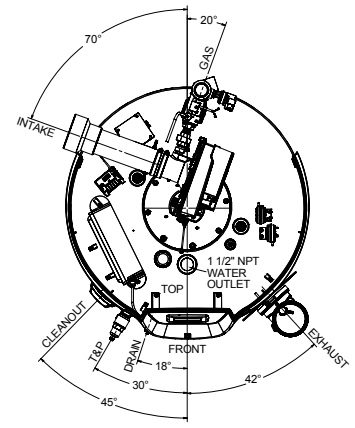
Electrical characteristics-120V-60Hz A.C., 5.0 A
"A" in model represents ASME construction
Propane gas models available
Dimensions and specifications subject to change without notice in accordance with our policy of continuous product improvement.

Commercial Gas Water Heaters

BTH 300-500







Model Number	Approx. Capacity		Dimensions										lb/kg	Approx. Shipping Weight Std	Approx. Shipping Weight ASME
			A	B	C	D	E	F	G	H	I	J			
BTH-300(A)	Gallons	119	75 3/4	52	33 1/8	4 3/4	4 3/4	63 1/8	12 3/4	69 1/4	74 1/2	23	lb	855	855
	Liters	450.96	192.41	132.08	84.12	12.07	12.07	160.35	32.39	175.9	189.23	58.43	kg	387	387
BTH-400(A)	Gallons	119	75 3/4	52	33 1/8	4 3/4	4 3/4	63 1/8	12 3/4	69 1/4	74 1/2	23	lb	855	855
	Liters	450.96	192.41	132.08	84.12	12.07	12.07	160.35	32.39	175.9	189.23	58.43	kg	387	387
BTH-500(A)	Gallons	119	75 3/4	52	33 1/8	4 3/4	4 3/4	63 1/8	12 3/4	69 1/4	74 1/2	23	lb	855	855
	Liters	450.96	192.41	132.08	84.12	12.07	12.07	160.35	32.39	175.9	189.23	58.43	kg	387	387

Electrical characteristics-120V-60Hz A.C., 5.0 A
"A" in model represents ASME construction
Propane gas models available
Dimensions and specifications subject to change without notice in accordance with our policy of continuous product improvement.

Commercial Gas Water Heaters

RECOVERY CAPACITY

Model Number	Type of Gas	Input		Thermal Efficiency
		BTU/HR	kW	
BTH-120(A)	Natural/Propane	120,000	35	95%
BTH-150(A)	Natural/Propane	150,000	44	98%
BTH-199(A)	Natural/Propane	199,900	58	97%
BTH-250(A)	Natural/Propane	250,000	73	96%
BTH-300(A)	Natural/Propane	300,000	88	96%
BTH-400(A)	Natural/Propane	399,900	117	95%
BTH-500(A)	Natural/Propane	499,900	146	95%

Model Number	U.S. GALLONS/HR AND LITRES/HR AT TEMPERATURE RISE INDICTATED													
	Approx. Capacity	°F	30°F	40°F	50°F	60°F	70°F	80°F	90°F	100°F	110°F	120°F	130°F	140°F
		°C	17°C	22°C	28°C	33°C	39°C	44°C	50°C	56°C	61°C	67°C	72°C	78°C
BTH-120(A)	60 U.S. Gals.	GPH	461	345	276	230	197	173	154	138	126	115	106	99
	227 Litres	LPH	1743	1308	1046	872	747	654	581	523	475	436	402	374
BTH-150(A)	100 U.S. Gals.	GPH	594	445	356	297	255	223	198	178	162	148	137	127
	379 Litres	LPH	2248	1686	1349	1124	963	843	749	674	613	562	519	482
BTH-199(A)	100 U.S. Gals.	GPH	783	588	470	392	336	294	261	235	214	196	181	168
	379 Litres	LPH	2965	2224	1779	1483	1271	1112	988	890	809	741	684	635
BTH-250(A)	100 U.S. Gals.	GPH	970	727	582	485	416	364	323	291	264	242	224	208
	379 Litres	LPH	3670	2753	2202	1835	1573	1376	1223	1101	1001	918	847	786
BTH-300(A)	119 U.S. Gals.	GPH	1164	873	698	582	499	436	388	349	317	291	269	249
	450.96 Litres	LPH	4405	3304	2643	2202	1888	1652	1468	1321	1201	1101	1017	944
BTH-400(A)	119 U.S. Gals.	GPH	1535	1151	921	767	658	576	512	460	419	384	354	329
	450.96 Litres	LPH	5810	4358	3486	2905	2490	2179	1937	1743	1585	1453	1341	1245
BTH-500(A)	119 U.S. Gals.	GPH	1919	1439	1151	959	822	720	640	576	523	480	443	411
	450.96 Litres	LPH	7263	5448	4358	3632	3113	2724	2421	2179	1981	1816	1676	1556

Recovery capacities are based on AHRI rated thermal efficiencies.
For ASME Construction add an "A" to the end of the model number ex: BTH-120A.

STORAGE CAPACITY

Model Number	U.S. Gallons	Liters
BTH 120	60	227
BTH 150	100	379
BTH 199	100	379
BTH 250	100	379
BTH 300	119	450.96
BTH 400	119	450.96
BTH 500	119	450.96

GAS LINE CONNECTION SIZE

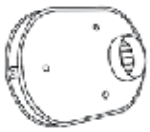
Model	Series	Natural Gas	Propane Gas
BTH 120	300/301	3/4" NPT	3/4" NPT
BTH 150	300/301	3/4" NPT	3/4" NPT
BTH 199	300/301	3/4" NPT	3/4" NPT
BTH 250	300/301	3/4" NPT	3/4" NPT
BTH 300	300/301	1-1/2" NPT	1-1/2" NPT
BTH 400	300/301	1-1/2" NPT	1-1/2" NPT
BTH 500	300/301	1-1/2" NPT	1-1/2" NPT

Commercial Gas Water Heaters

OPTIONAL KITS

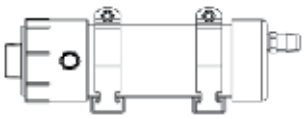
OPTIONAL CONCENTRIC VENT KITS

- BTH-120 - 250 vent kit p/n 100111100
- BTH-300 - 500 vent kit p/n 100113124



OPTIONAL LOW PROFILE TERMINATION VENT KITS

- 3˝ Flush Mount Vent Kit p/n 100187887
- 4˝ Flush Mount Vent Kit p/n 100187888
- 6˝ Flush Mount Vent Kit p/n 100187889



OPTIONAL CONDENSATE NEUTRALIZATION KITS

- BTH-120-199 kit p/n 100112380
- BTH-250-500 kit p/n 100112381

COMMON VENTING KITS FOR UP TO 3 WATER HEATERS (ONE KIT PER WATER HEATER REQUIRED)

Kit	Description
100227396	PVC Common Vent Kit, 120 – 250 Models
100223775	PVC Common Vent Kit, 300 – 500 Models
100227395	Polypropylene Common Vent Kit, 120 -250 Models
100223774	Polypropylene Common Vent Kit, 300 - 500 Models

Installations must comply with all national, state and local codes.
See kit instructions and corresponding water heater manual for detailed installation instructions and additional information.
50 Feet maximum equivalent length of straight pipe common vent and elbows
NOTE: Order 1 kit for each water heater.
See the Common Vent Kit manual or spec sheet for detailed information.

SPECIFICATION

(Natural or Propane) gas water heater(s) shall be A. O. Smith Cyclone Mxi model # _____ or equal, minimum 95% thermal efficiency, a storage capacity of _____ gallons, an input rating of _____ BTUs per hour, a recovery rating of _____ gallons per hour (gph) at 100°F rise and a maximum hydrostatic working pressure of 160 psi. Water heater(s) shall: 1. Modulating gas burner that automatically adjusts the input based on demand. 2. Powered anodes that are non sacrificial and maintenance free. 3. Have seamless glass-lined steel tank construction, with glass lining applied to all water-side surfaces after the tank has been assembled and welded; 4. Meets the thermal efficiency and/or standby loss requirements of the U. S. Department of Energy and current edition of ASHRAE/IES 90.1; 5. Have foam insulation and a CSA Certified and ASME rated T&P relief valve; 6. Have a down-fired power burner designed for precise mixing of air and gas for optimum efficiency, requiring no special calibration on start-up; 7. Be approved for 0˝ clearance to combustibles.

The control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout. 1. All models are design certified by Underwriters Laboratories (UL), Inc., according to ANSI Z21.10.3 - CSA 4.3 standards governing storage type water heaters; 2. Meet the thermal efficiency and standby loss requirements of the U. S. Department of Energy and current edition ASHRAE/IES 90.1. Complies with SCAQMD Rule 1146.2 and other air quality management districts with similar requirements for low NOx emissions.

120K-250K BTU Input: For Standard Power Venting: Water heater(s) shall be suitable for power venting using a (3˝ or 4˝) _____ diameter PVC pipe for a total distance of (50 ft or 120 ft.) _____ equivalent feet of vent piping. For Power Direct Venting: Water heater(s) shall be suitable for power direct venting using a (3˝ or 4˝) _____ diameter PVC pipe for a total distance of (50 ft or 120 ft.) _____ equivalent feet of vent piping and (50 ft. or 120 ft.)_____ equivalent feet of intake air piping.

300K - 500K BTU Input: For Standard Power Venting: Water heater(s) shall be suitable for standard power venting using a (4˝ or 6˝)_____ diameter PVC pipe for a total distance of (70 ft. or 120 ft.)_____ equivalent feet of vent piping. For Power Direct Venting: Water heater(s) shall be suitable for power direct venting using a (4˝ or 6˝) _____ diameter PVC pipe for a total distance of (70 ft or 120 ft.) _____ equivalent feet of vent piping and (70 ft. or 120 ft.)_____ equivalent feet of intake air piping.

Operation of the water heater(s) in a closed system where thermal expansion has not been compensated for (with a properly sized thermal expansion tank) will void the warranty.

Water heater should incorporate the iCOMM™ system for remote monitoring, leak detection and fault alert.

For Technical Information, call 800-527-1953. A. O. Smith Corporation reserves the right to make product changes or improvements without prior notice.

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Commercial Gas Water Heater

CYCLONE® HE POWER VENT

The Cyclone® HE is a light-duty, power vent, fully condensing commercial gas water heater with an internal helical heat exchanger, similar to the design of A. O. Smith's industry-leading Cyclone® models. This helical heat exchanger helps Cyclone® HE achieve 94% thermal efficiency and deliver outstanding hot water output.

INTELLI-VENT™* GAS CONTROL WITH SILICON NITRIDE HOT SURFACE IGNITOR

- Premium-grade hot surface ignitor eliminates standing pilot.
- Electronic circuitry provides superior system diagnostics capabilities plus extremely precise temperature control.
- Temperature control up to 181°F.

POWER VENT DESIGN FOR INSTALLATION VERSATILITY

- Modular blower, with 6-foot cord and standard 3-prong connector.
- Combined vertical and horizontal runs terminating through an outside wall, using Schedule 40 PVC, CPVC or polypropylene pipe: Canadian installations require ULC S636 approved pipe for venting.
  - 2" pipe allows vent runs up to 25 equivalent feet
  - 3" pipe allows vent runs up to 65 equivalent feet
  - 4" pipe allows vent runs up to 128 equivalent feet

HIGH OUTPUT WITH SMALL FOOTPINT

- 22" diameter, combined with 94% efficiency, 50-gallon tank and 76,000 BTU input means Cyclone® HE can be installed in less space than a larger 75-gallon unit, with equal or better performance.
- Total height is 71 1/8" to top of blower outlet.

GREEN CHOICE® GAS BURNER

- Patented eco-friendly burner design reduces NOx emissions by up to 33% and complies with Low-NOx emission requirements of less than 40 ng/J.

SIDE-MOUNTED TAPS FOR RECIRCULATING SYSTEMS

- Hot and cold side taps allow Cyclone® Power Vent to be used for combination systems for water heating plus space heating, radiant floor heating or other applications requiring a recirculating hot water loop.

BLUE DIAMOND® GLASS COATING WITH TWO HEAVY DUTY ANODE RODS

- Provides superior corrosion resistance compared to industry standard glass lining.

DYNACLEAN™ DIFFUSER DIP TUBE

MAXIMUM HYDROSTATIC WORKING PRESSURE: 150 PSI

STANDARDS AND CERTIFICATIONS

- Meets UBC, CEC and ICC National Codes.
- Meets the thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IES 90.1.
- Design certified by Underwriters Laboratories Inc. under American National Standard/CSA Standard for Gas Water Heaters ANSI Z21.10.3 - CSA 4.3 (current edition).
- CSA certified and ASME rated T&P relief valve.
- Not recommended for sanitation rinse.

3-YEAR LIMITED TANK AND 1-YEAR LIMITED PARTS WARRANTY

- For complete warranty information, consult written warranty or go to hotwater.com.

*Intelli-Vent™ is a trademark of Emerson Electric Company

SERIES 120

Low Lead Content

GAS-FIRED
LISTED

Green Choice™
The Eco-Friendly Gas-Fired Burner

AHRI CERTIFIED®
www.ahridirectory.org

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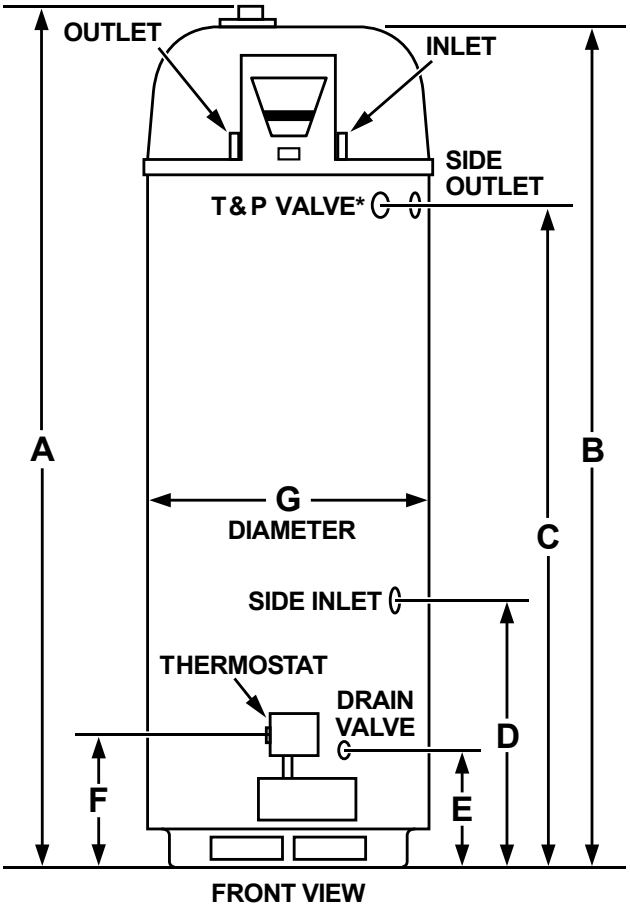
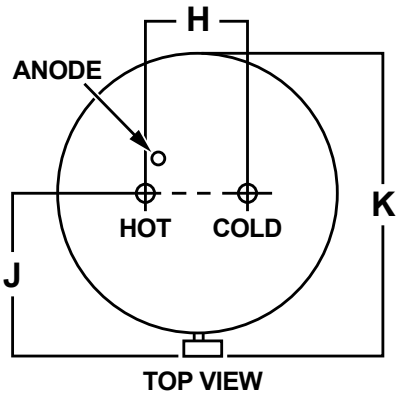
Commercial Gas Water Heater





* INSTALL IN ACCORDANCE WITH LOCAL CODES

Model Number	Gallon/ Litre Capacity	Recovery @ 90°F Rise Gallon Per Hour	BTU Input Per Hour	Dimensions	A	B	C	D	E	F	G	H	J	K	Approx. Shipping Weight (lbs/kg)
BTX-80	50/189	95	76,000	Inches	71-1/8	68 3/4	51 7/8	20 7/8	9-1/8	12	22	8	15-3/4	27	225/102
				cm	181	175	132	53	23	30	56	20	40	68	

Available in natural gas only.
Top inlet and outlet connections: ¾" male NPT.
Circulation loop connections: ¾" female NPT.
Standard model certified for sea level to 5,300 ft. elevation. Order SMR K30 for elevations to 10,100 ft.
Optional Condensate Neutralizer Kit available (Part Number 100112380).
Electrical characteristics: 120 volt, 60 Hz <5 amps

Model Number	Recovery Capacities													
	Temperature Rise	°F	30	40	50	60	70	80	90	100	110	120	130	140
		°C	17	22	28	33	39	44	50	56	61	67	72	78
BTX-80	GPH		286	215	172	143	123	107	95	86	78	72	66	61
	LPH		1084	813	651	542	465	407	361	325	296	271	250	232

For Technical Information, call 800-527-1953. A. O. Smith Corporation reserves the right to make product changes or improvements without prior notice.

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CONDENSING COMMERCIAL GAS WATER HEATERS

ARMOR®
CONDENSING WATER HEATER

SMART SYSTEM™
OPERATING CONTROL FEATURING
A BUILT-IN CASCADING SEQUENCER

8 MODELS FROM 150,000 TO
800,000 BTU/HR

FIRING RATE MODULATION TO 5:1

LESS THAN 20 ppm NOx

DIRECT-VENT FLEXIBILITY TO 100 FEET

LOW NOx Certified
PROTECTING THE ENVIRONMENT

UP TO 98%
THERMAL EFFICIENCY

Lochinvar®
High Efficiency Water Heaters, Boilers and Pool Heaters

Lochinvar.com

ARMOR®
CONDENSING WATER HEATER

A Better Way to Achieve 98% Thermal Efficiency

ARMOR is a fully condensing commercial gas water heater. Available in eight models with inputs ranging from 150,000 to 800,000 Btu/hr, the ARMOR achieves thermal efficiencies up to 98%.

Separate Tank for Flexibility, Lower Replacement Costs

With standard tank-type water heaters, your choices are limited when it comes to matching input with storage capacity to meet "peak demand" delivery requirements. With ARMOR, you can match one or more water heaters with inputs ranging from 150,000 to 800,000 with one or more storage tanks in a wide variety of sizes. Lochinvar Lock-Temp® tanks are available to meet the need, from our 80-gallon vertical to the 5000-gallon vertical or horizontal model. Another advantage of the ARMOR "dual component" system is lower replacement costs. Standard tank-type designs require replacement of the entire water heater. With ARMOR, you'll save time and money by only replacing individual components as needed, such as the pump or storage tank.

AW (286-801)

Fully Modulating with 5:1 Turndown

ARMOR features advanced Negative Regulation (Neg/Reg) sealed combustion technology, permitting fan speed to constantly adjust the volume of fuel and air entering the burner. This ensures that ARMOR can safely and reliably operate with supply gas pressure as low as 4 inches water column.

ARMOR is equipped with fully modulating combustion with 5:1 turndown. This means ARMOR can fire as low as 20% of maximum input when water heating demand is lowest, and increase the firing rate up to 100% as demand increases. The result is better overall efficiency and less cycling, compared to all other tank-type units which are "on-off," which means they can only fire at 100% of maximum input.

Stainless Steel Condensing Heat Exchanger

The ARMOR's stainless steel heat exchanger is built to ASME Section IV requirements. Its design provides superior resistance to corrosion caused by condensation from low entering water temperatures. Traditional commercial water heaters will fail early with low entering water temperatures; however, with the ARMOR the lower the supply water temperature the more efficiently it performs throughout the life of the heater.

Direct-Venting up to 100 Feet

Sidewall Vent Termination

ARMOR offers 7 venting options and tremendous flexibility for placement of units within the building, because it permits direct-vent air intake and exhaust runs up to 100 equivalent feet using either PVC, CPVC, Polypropylene or AL29-4C stainless steel vent pipe. Intake and exhaust runs can terminate horizontally through a sidewall or vertically through the roof.

**Optional Concentric Vent Kit Sold Separately (for 151-601 Models)*

Factory Supplied and Shipped Standard with Every Model

Lochinvar SMART SYSTEM™

The Ultimate Water Heater Operating Control with Graphic LCD Display

Night Setback Capabilities
- Setback of Storage Tank Temp
- Setback of Building Recirculating Temperature*

Water heater pump control:
- Pump delay with freeze protection
- Building Recirculation Pump Control*
- Pump exercise

High-voltage terminal strip:
- 110 Vac input to water heater
- Dry Contacts for Water Heater Pump Control
- Dry Contacts for Building Recirc. Pump Control *

Low-voltage terminal strip with 28 points of connection
- 0-10V Water Heater Rate Output
- 0-10V Heat Demand Input
- Modbus Contacts

USB Connection Point for optional SMART SYSTEM PC software with advanced setup and diagnostics

Modbus Compatibility (Optional)

** Exclusive to Lochinvar Smart System*

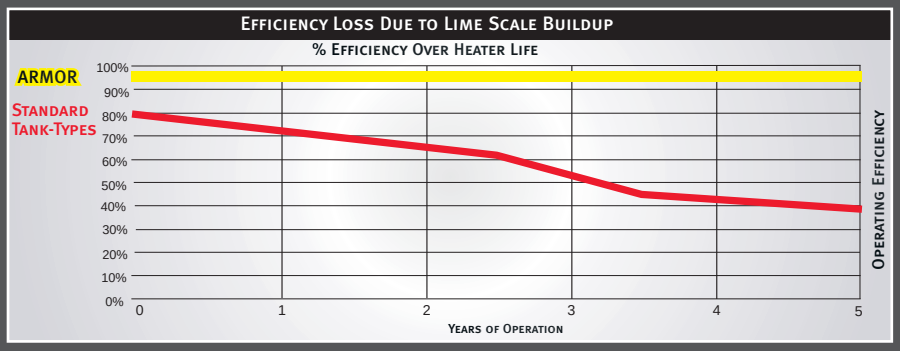
Long-Lasting "Life Cycle" Efficiency

In a standard tank-type water heater, lime scale builds up over time on important heat transfer surfaces, insulating the water from the heat source. This buildup in the bottom of the tank and around the flue tubes can cause tank-type heaters to fail in as little as 2-3 years. This decreases thermal efficiency and increases operating cost. Just 1/4" of lime scale in the tank can increase operating costs as much as 25%!

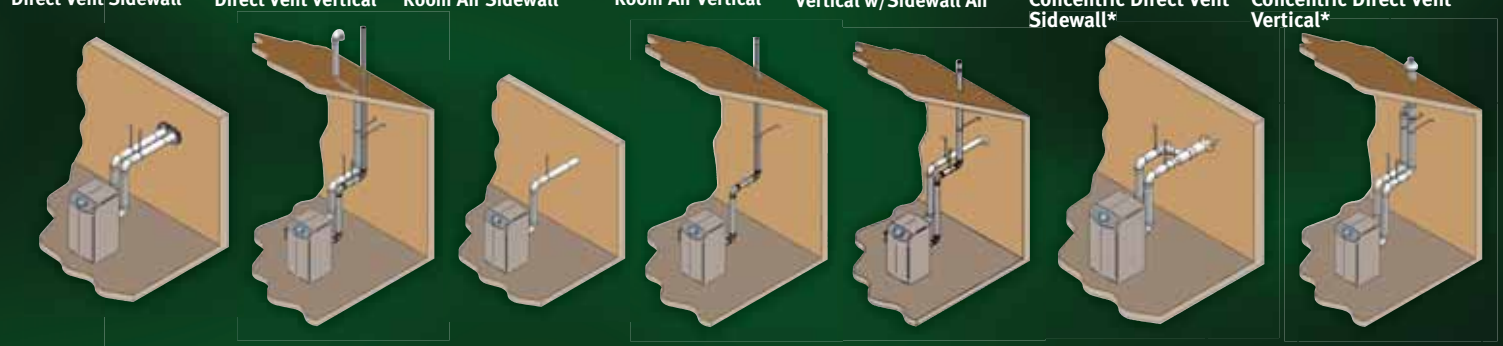
ARMOR's "dual component" concept eliminates the impact of lime scale, maintaining a high-rated thermal efficiency and low operating cost throughout its long life cycle.

The chart below illustrates how ARMOR is a better way, delivering true "life cycle efficiency" compared to standard tank-type units.

Traditional tank-type water heater flue tubes with nearly 6" of lime scale buildup

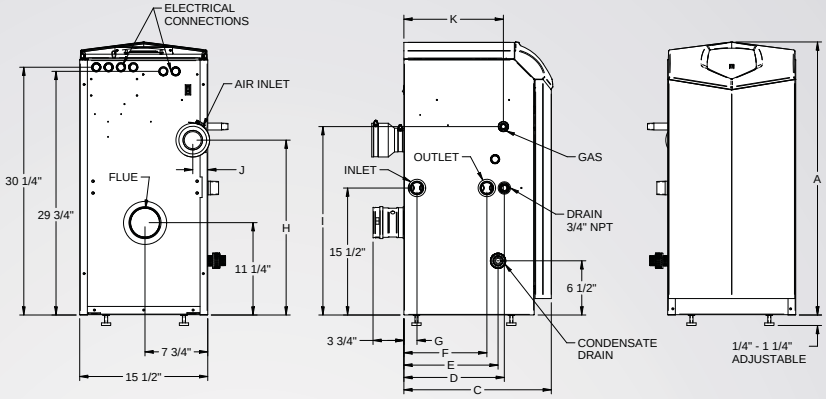


Flexible Venting Options - Up to 100 feet of air intake and 100 feet of exhaust vent with PVC, CPVC, Polypropylene or SS.

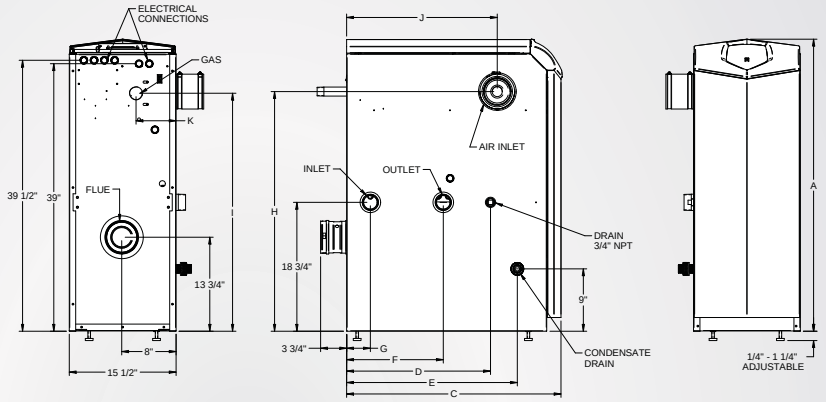


ARMOR™ WATER HEATER DIMENSIONS AND SPECIFICATIONS

MODELS 151 & 200



MODELS 286-801



Model Number Guide

AW	N	151	PM
Model	Natural Gas	Btu/hr Input	Pump Mount

***A**rmor **W**ater Heater,*
***N**atural Gas,*
***150**,000 Btu/hr Input,*
***P**ump **M**ount*

Model Number	Btu/hr Input	GPH @ 100° Rise	A	C	D	E	F	G	H	I	J	K	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Shipping Wt. (lbs.)
AWN151PM	150,000	174	33-1/4″	18″	12-1/4″	11-1/2″	10″	1-1/2″	21-1/4″	23″	1-3/4″	12″	1/2″	1-1/4″	3″	3″	165
AWN200PM	199,999	235	33-1/4″	22-1/4″	16-1/2″	15-3/4″	14-1/4″	5-1/4″	21-1/4″	23″	1-3/4″	16-1/4″	1/2″	1-1/4″	3″	3″	185
AWN286PM	285,000	339	42-1/2″	19-3/4″	12-3/4″	13-1/2″	6″	2″	34″	31″	11-3/4″	4-1/4″	3/4″	2″	4″	4″	235
AWN400PM	399,999	475	42-1/2″	27″	21″	20-3/4″	14″	3-1/2″	34″	34″	18-3/4″	2″	1″	2″	4″	4″	295
AWN501PM	500,000	594	42-1/2″	31-1/2″	21″	25″	14″	3-1/2″	35″	35″	22″	5-3/4″	1″	2″	4″	4″	335
AWN601PM	600,000	713	42-1/2″	36-1/4″	25″	21″	14″	3-1/2″	36″	32-3/4″	19-1/2″	5-1/2″	1″	2″	4″	4″	380
AWN701PM	700,000	832	42-1/2″	40-1/4″	29″	23″	17″	3-1/2″	36″	32-3/4″	23-1/2″	3-1/4″	1″	2″	4″	6″	461
AWN801PM	800,000	950	42-1/2″	45-1/4″	33-1/4″	23″	17″	3-1/2″	36″	32-3/4″	27-3/4″	3-1/4″	1″	2″	4″	6″	527

STANDARD FEATURES

- **Up to 98% Thermal Efficiency**
- **Modulating Burner with 5:1 Turndown**
  - Direct-Spark Ignition
  - Low NOx Operation
  - Sealed Combustion
  - Low Gas Pressure Operation
- **Vertical & Horizontal Direct-Vent**
  - PVC, CPVC, Polypropylene or SS up to 100 Feet
  - PVC/CPVC Sidewall Vent Termination
- **Stainless Steel Heat Exchanger**
  - All Welded Construction, Gasketless Design
  - 160 psi Working Pressure
  - ASME Construction (AW 286-800)
- Natural to L.P. Conversion Kit
- All Bronze Circulating Pump
- On/Off Switch
- Flow Switch
- ASME Temperature & Pressure Relief Valve (286-801)
- Temperature & Pressure Gauge (AW 501-801)
- Downstream Test Valves (AW 501-801)
- Adjustable Leveling Legs
- Tank Sensor
- Adjustable High Limit w/ Manual Reset
- Automatic Reset High Limit
- Condensate Trap
- Zero Clearances to Combustible Material
- 5 Year Limited Warranty (See Warranty for Details)
- 1 Year Parts Warranty (See Warranty for Details)

SMART SYSTEM FEATURES

- **SMART SYSTEM Digital Operating Control**
- Multi Color Graphic LCD Display
- **Built in Cascading Sequencer for up to 8 Water Heaters**
  - Lead Lag
  - Efficiency Optimization
- **Building Management System Integration**
  - Modbus Communication (Optional)
  - 0-10VDC Input to Control Modulation or Set point
  - 0-10VDC Modulation Rate Output
  - 0-10VDC Input to Enable/Disable call for heat
- Access to BMS Settings Through Graphic LCD Display
- Low Water Flow Safety Control & Indication
- Inlet & Outlet Temperature Sensors & Readout
- Flue Temperature Sensor
- Water Heater Pump Control
- Pump Delay with Freeze Protection
- Pump Exercise
- Night Setback
- Building Recirculation Loop Pump Control*
  - Night Setback of Building Recirculation Loop*
- Time Clock
- **Maintenance Reminder**
  - Ability to program name and number into the product as contact

**Exclusive to Lochinvar*

- **High Voltage Terminal Strip**
  - 120 VAC / 60 Hertz / 1 Phase Power Supply
  - Pump Control Contacts
    - Water Heater Pump Control Contacts
    - Building Recirculation Pump Control Contacts
- **Low Voltage Terminal Strip**
  - 24 VAC Auxiliary Device Relay
  - Auxiliary Proving Switch Contacts
  - Flow Switch Contacts
  - Alarm on Any Failure Contacts
  - Runtime Contacts
  - Tank Sensor Contacts
  - Cascade Contacts
  - 0-10 VDC BMS External Control Contact
  - 0-10VDC Boiler Rate Output Contacts

FIRING CONTROL SYSTEMS

- M9 Standard Construction
- M7 California Code (AW 286-801)

OPTIONAL EQUIPMENT

- Alarm Bell
- Condensate Neutralization Kit
- High & Low Gas Pressure Switches (AW 501-801)
- Concentric Vent Kit (3” & 4” PVC/CPVC only)
- BMS Gateway
- ModBus Communications
- SMART SYSTEM PC Software
- Room Air Vent Kits
- Stack Frame

HLW

Lochinvar®
High Efficiency Water Heaters, Boilers and Pool Heaters

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INTELLI-HOOD®

Melink®

Kitchen ventilation controls...that grow your bottom line

INTELLI-HOOD® Controls: The Industry Standard

The Melink Intelli-Hood controls are the industry standard for commercial kitchen ventilation systems. Mechanical engineers, foodservice consultants, energy service companies, and chain operators are specifying them on thousands of hoods for both new and existing facilities around the world.

Savings & Benefits

The Intelli-Hood controls reduce your exhaust and make-up fan speeds during idle, non-cooking conditions. **This yields fan energy savings of up to 90% and conditioned air savings of up to 50%. The result is a typical payback of 1- 3 years.**

More than 8,000 Installations Worldwide

Realizing the huge potential for fan energy and conditioned air savings, Melink pioneered the demand ventilation system for use in various food service facilities more than 20 years ago. Since then, we have completed more than 8,000 installations in:

- Restaurants
- Supermarkets
- Hotels
- K-12 Schools
- Colleges & Universities
- Hospitals
- Government Buildings
- Military Facilities
- Corporate Dining
- Clubs

Melink

Melink's patented technology is the difference - providing superior performance and energy savings

Note: The red line represents a infrared beam that detects smoke and vapors inside the hood, increasing the fan speed to 100% when necessary.

Intelli-Hood® Advantages

Melink pioneered demand ventilation controls for commercial kitchen hoods over 20 years ago, and has installed more than 8,000 systems worldwide over the years. Key advantages include:

- Optic Sensors allow a lower minimum speed for greater energy savings
- Optic Sensors ensure robust capture and containment of all smoke
- Plug and play cables eliminate installation problems
- Remote monitoring allows energy savings to be verified
- Intelligent algorithms provide automatic daily calibration
- Melink national network of trained technicians is best in industry

Melink®

INTELLI-HOOD® Saves up to 90% in Fan Energy and 50% in Conditioned Air

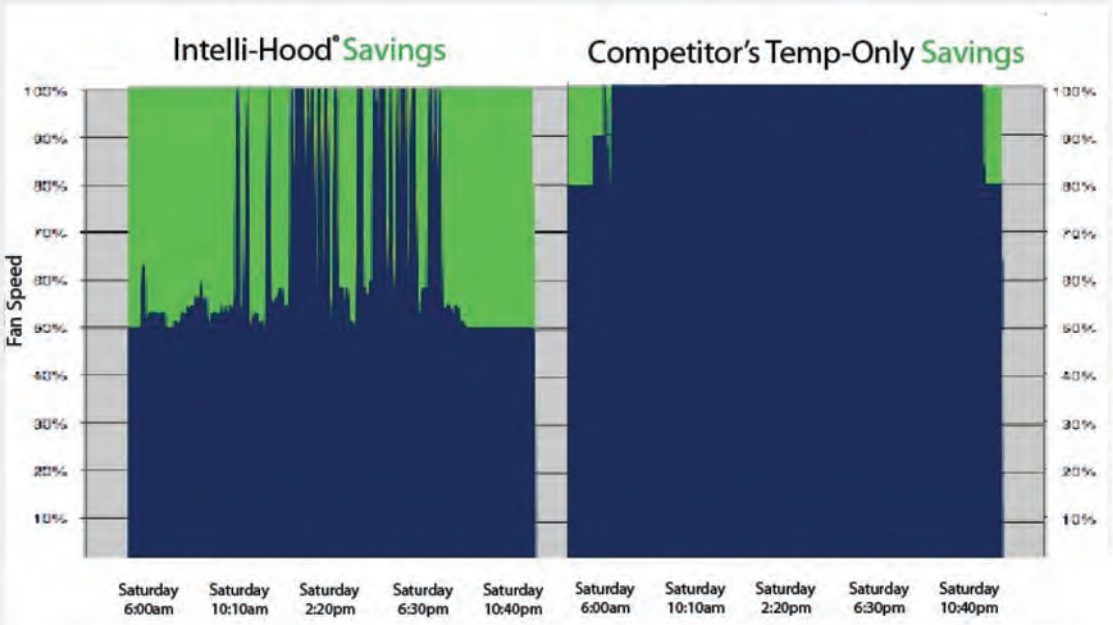
Most commercial kitchen hoods operate at 100% capacity all day long, even during idle, non-cooking conditions. Melink was the first to solve this industry problem through variable-speed control.

Actual Energy Savings

Typical Dinner House Restaurant

% Fan Speed

Energy Savings



Simple to Install & Operate

Intelli-Hood controls are easily installed on new hoods and retrofitted on existing hoods. The Temperature and Optic Sensors get mounted inside the hood/duct, and the Keypad, Processor, and Variable-Speed Drives typically get mounted in an end-cabinet or on a kitchen wall.

To operate, the cook/chef simply presses the light and fan switch on the Keypad, and the system begins operating. When the cooking appliances are turned on, the fan speeds increase based on the exhaust air temperature. During actual cooking, the speeds increase to 100% until the smoke/vapor is removed.

Melink's Intelli-Hood Keypad controls up to four hoods

Melink®

What Our Customers Say About INTELLI-HOOD®

"HEI Hotels and Resorts established its energy conservation guidelines that required all energy-saving renovations and upgrades deliver a ROI in three years or less. We achieved this goal by implementing standard energy-saving measures including the Melink Intelli-Hood kitchen exhaust control system."

- Bob Holesko, Vice President of Facilities for HEI Hotels and Resorts

"The best thing a hotel can do to reduce its environmental footprint is to reduce its energy use. The Melink Intelli-Hood system is one promising way to do so. Our Engineering Department working with the Engineers from each of our Hotel brands has fully evaluated Intelli-Hood and everyone is convinced that this is one of our most cost-effective paths to sustainability."

- Randy P. Gaines, Vice President Engineering Americas for Hilton Worldwide

"The day we started the hoods in the Wine Spectators Greystone Restaurant, the manager commented on how much the Melink system had improved the dining experience for the guests. In addition, the chef instructors commented that it was nice to talk and give cooking demos to the students with having not to yell over the noise of the hoods! The best part of installing the Intelli-Hood is the energy and money we are saving."

- Greg Phipps, Director of Facilities, Sodexo Education Facilities - The Culinary Institute of America at Greystone

Photo Courtesy of Greenheck Fan Corporation

Melink®

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About Melink

Melink Corporation is a provider of energy efficiency and renewable energy solutions for commercial and institutional facilities. The company offers building commissioning services, kitchen ventilation controls and solar PV systems.

Melink's corporate headquarters is LEED Platinum certified. It is also a Net-Zero Energy building making it one of the greenest buildings in the world.

To learn more about Melink, visit our website at www.melinkcorp.com.

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Melink®
Energy solutions for a brighter tomorrow™

ZR-T TrueWhite® Series

ZR24™ 2' x 4' TrueWhite® Series LED Troffer with Gloss Finish

Product Description

The ZR-T TrueWhite® Series LED troffer delivers up to 5000 lumens of superior 90+ CRI light quality and is perfect for both new construction and renovation. Powered by Cree TrueWhite® Technology, the slim and lightweight ZR-T LED troffer boasts an efficacy of up to 114 LPW performance along with 0-10V dimming to meet local energy codes. The ZR24™ LED troffer embodies a breakthrough in balancing energy savings, visual comfort and initial cost.

Performance Summary

Utilizes Cree TrueWhite® Technology

Efficacy: 100-114 LPW

Initial Delivered Lumens: 4,000 or 5,000 lumens

Input Power: 40-44 watts

CRI: 90+ CRI

CCT: 3000K, 3500K, 4000K, 5000K

Input Voltage: 120-277 VAC or 347 VAC

Limited Warranty†: 10 years on luminaire

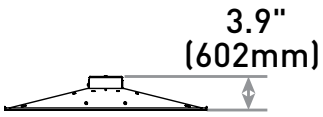
Limited Warranty Emergency Back Up (EB) Battery: 1 Year on Battery Back Up. Test regularly in accordance with local codes

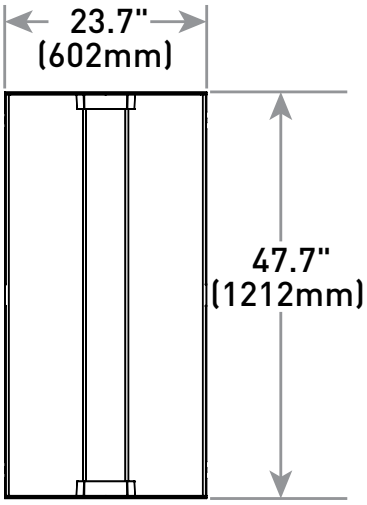
Controls: 0-10V dimming to 5%

Mounting: Recessed*

Room-side accessible snap and lock removable lens

† See http://lighting.cree.com/warranty for warranty terms
* Not intended for use with 9/16" T-Bar grids unless used with a 9/16" accessory clip like "Armstrong® LFC- Fixture Clip" which can be purchased through distribution. Consult factory for non-standard grid applications.





Accessories

Field-Installed	
Drywall Grid Adapter DGA24-WHT **Surface Mount Kit** SMK-ZR24 - Not for use with EB14 or SmartCast® Technology **6' Flexible Power Whip** PW-18/4-06-9T/SS - For use in non-dimming applications only	**Wireless 0-10V Dimming/Switching Interface with Cree Smartcast® Technology** CIF-10V-CWC-SNSR - For use with luminaires with 10V controls when integral SmartCast isn't available **Cree SmartCast® Technology Configuration Tool** CCT-CWC-1 - One required per project when CIF-10V is selected **Chicago Plenum Field Kit** CPLZR - Fits all ZR types to be installed in the field

Ordering Information

Example: ZR24T-40L-35K-10V

ZR24T				10V	
Product	**Initial Delivered Lumens**	**CCT**	**Voltage**	**Control**	**Options**
ZR24T	**40L** 40W, 4,000 Lumens **50L** 44W, 5,000 Lumens	**30K** 3000K **35K** 3500K **40K** 4000K **50K** 5000K	**Blank** 120-277 Volt **34** 347 Volt - Available with 40L only	**10V** 0-10V dimming to 5%	**EB14 Emergency Backup** - 1,400 lumens - Not available with 347 Volt - Provides 90 minutes of emergency operation

Rev. Date: V2 05/04/2017

US: lighting.cree.com T (800) 236-6800 F (262) 504-5415
Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CREE TRUEWHITE® TECHNOLOGY

A revolutionary way to generate high-quality white light, Cree TrueWhite® Technology is a patented approach that delivers an exclusive combination of 90+ CRI, beautiful light characteristics, and lifelong color consistency, all while maintaining high luminous efficacy – a true no compromise solution.

CONSTRUCTION & MATERIALS

- Durable 22 ga. cold rolled steel housing provides strength and uniformity
- Ultra-thin 3.9" (99mm) luminaire height and lightweight design effectively target a broad range of plenum spaces and allow for easy installations
- Luminaire is pre-painted for enhanced gloss finish
- Includes t-bar clips and holes for mounting support wires (by others)
- Luminaire sides and ends are hemmed in for safe, easy handling
- Includes lens gasket to prevent ingress of insects
- Not for installation within 3" (76mm) of insulation
- Removable lens for easy maintenance and cleaning
- Magnetic lens to prevent dust and bug intrusion

OPTICAL SYSTEM

- Unique luminaire design creates perfect balance of both horizontal and vertical illumination
- Optimized smooth acrylic lens eliminates pixelation and delivers a low-glare, diffused light distribution

ELECTRICAL SYSTEM

- Cree born components including highly efficacious Cree® LED chips along with an integral high-efficiency Cree® driver
- **Power Factor:** = 0.9 nominal for 120-277V
- **Input Power:** Stays constant over life
- **Input Voltage:** 120-277V or 347V, 60Hz
- **Operating Temperature Range:** 0˚C - + 35˚C (32˚F - + 95˚F)
- **Total Harmonic Distortion:** < 20% for standard fixtures; < 25% for EB option

CONTROLS

- Continuous dimming to 5% with 0-10V DC control protocol
- **10V Source Current:** 0.25mA
- For use with Class 2 dimming systems only
- Use only lighting controls with neutral connection or controls intended for use with LED fixtures
- Reference www.creelink.com/exLink.asp?7098214OZ58R34I26620963 for recommended dimming controls and wiring diagrams

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for damp locations
- Designed for indoor use
- UL924 (EB option). Maximum mounting height: 15.0' (4.6m)
- RoHS compliant. Consult factory for additional details
- Meets FCC Part 15, Subpart B, Class A standards for conducted and radiated emissions
- DLC qualified. Please refer to www.designlights.org/QPL for most current information

Electrical Data*

Initial Delivered Lumens	System Watts 120-347V	Total Current (A)				
		120V	208V	240V	277V	347V
40L	40	0.37	0.21	0.19	0.16	0.13
40L w/EB14 Option	44	0.41	0.24	0.20	0.18	N/A
50L	44	0.41	0.24	0.20	0.18	N/A
50L w/EB14 Option	48	0.44	0.26	0.22	0.19	N/A

* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-347V +/- 10%

Recommended ZR-T Series Lumen Maintenance Factors (LMF)[1]

Ambient	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Calculated[3] LMF	100K hr Calculated[3] LMF
0˚C (32˚F)	1.04	1.04	1.04	1.04	1.04
5˚C (41˚F)	1.03	1.03	1.03	1.03	1.03
10˚C (50˚F)	1.02	1.02	1.02	1.02	1.02
15˚C (59˚F)	1.02	1.02	1.02	1.02	1.02
20˚C (68˚F)	1.01	1.01	1.01	1.01	1.01
25˚C (77˚F)	1.00	1.00	1.00	1.00	1.00
30˚C (86˚F)	0.99	0.99	0.99	0.99	0.99
35˚C (95˚F)	0.98	0.98	0.98	0.98	0.98

[1] Lumen maintenance values at 25˚C are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)

Application Reference

Open Space

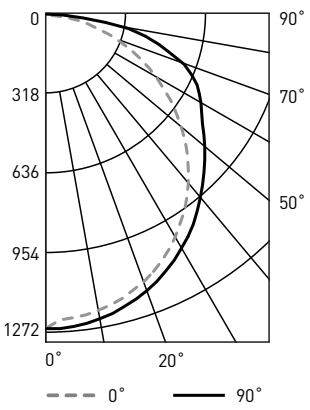
Spacing	Initial Delivered Lumens	Lumens	Wattage	LPW	w/ft²	Average fc
8 x 8	40L	4,000	40	100	0.6	56
	50L	5,000	44	114	0.66	70
8 x 10	40L	4,000	40	100	0.5	47
	50L	5,000	44	114	0.55	59
10 x 10	40L	4,000	40	100	0.4	38
	50L	5,000	44	114	0.44	47
10 x 12	40L	4,000	40	100	0.32	30
	50L	5,000	44	114	0.35	38

10' ceiling: 80/50/20 reflectances; 2.5' workplane, open room. LLF: 1.0 Initial. Open Space: 50' x 40' x 10'

Photometry

ZR24T-40L-30K-10V BASED ON CREE REPORT TEST #: PL10459-001A

Luminaire photometry has been conducted by a NVLAP accredited testing laboratory in accordance with IESNA LM-79-08. IESNA LM-79-08 specifies the entire luminaire as the source resulting in a luminaire efficiency of 100%.



Coefficients Of Utilization – Zonal Cavity Method				
RC %:	80			
RW %:	70	50	30	10
RCR: 0	119	119	119	119
1	107	102	97	93
2	97	88	81	74
3	88	77	68	61
4	80	68	58	51
5	74	60	51	44
6	68	54	45	38
7	63	49	40	33
8	59	45	36	30
9	55	41	32	27
10	51	38	30	24

Effective Floor Cavity Reflectance: 20%

Zonal Lumen Summary			
Zone	Lumens	% Lamp	Luminaire
0-30	977	N/A	24.8%
0-40	1,602	N/A	40.7%
0-60	2,875	N/A	73.0%
0-90	3,940	N/A	100%
0-180	3,940	N/A	100%

Average Luminance Table (cd/m²)				
	Horizontal Angle			
Vertical Angle		0°	45°	90°
	45°	7,611	8,140	8,535
	55°	7,198	8,166	8,990
	65°	6,614	8,787	10,676
	75°	5,606	10,589	12,209
	85°	4,023	11,023	11,402

Reference http://lighting.cree.com/products/indoor/troffers/zr-series for detailed photometric data

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OSQ Series

OSQ™ LED Area/Flood Luminaire – Large

Product Description

The OSQ™ Area/Flood luminaire blends extreme optical control, advanced thermal management and modern, clean aesthetics. Built to last, the housing is rugged cast aluminum with an integral, weathertight LED driver compartment. Versatile mounting configurations offer simple installation. Its slim, low-profile design minimizes wind load requirements and blends seamlessly into the site providing even, quality illumination. The 'T' input power designator is a suitable upgrade for HID applications up to 750 Watts, and the 'U' input power designator is a suitable upgrade for HID applications up to1000 Watts.

Applications: Parking lots, walkways, campuses, auto dealerships, office complexes, and internal roadways

Performance Summary

NanoOptic® Precision Delivery Grid™ optic

Assembled in the U.S.A. of U.S. and imported parts

Initial Delivered Lumens: Up to 27,103

Efficacy: Up to 139 LPW

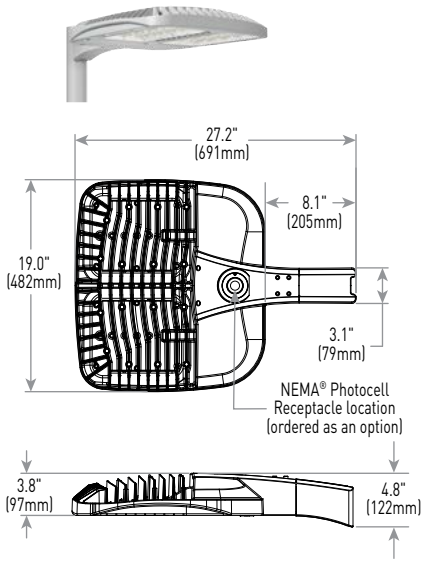
CRI: Minimum 70 CRI (4000K & 5700K; 3000K asymmetric optics); 80 CRI (3000K symmetric optics)

CCT: 3000K (+/- 300K), 4000K (+/- 300K), 5700K (+/- 500K)

Limited Warranty†: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

†See http://lighting.cree.com/warranty for warranty terms

DA Mount



Weight
28.5 lbs. (13kg)

Accessories

Field-Installed	
Backlight Shield OSQ-BLSLF – Front facing optics OSQ-BLSLR – Rotated optics	**Hand-Held Remote** XA-SENSREM - For successful implementation of the programmable multi-level option, a minimum of one hand-held remote is required

Ordering Information

Fully assembled luminaire is composed of two components that must be ordered separately:
Example: **Mount:** OSQ-AASV + **Luminaire:** OSQ-A-NM-2ME-T-40K-UL-SV

Mount (Luminaire must be ordered separately)*			
OSQ-			
OSQ-AA Adjustable Arm **OSQ-DA** Direct Arm	**Color Options:**	**SV** Silver **BK** Black	**BZ** Bronze **WH** White

* Reference EPA and pole configuration suitability data beginning on page 7

Luminaire (Mount must be ordered separately)

OSQ	A	NM						
Product	**Version**	**Mounting**	**Optic**	**Input Power Designator**	**CCT**	**Voltage**	**Color Options**	**Options**
OSQ	**A**	**NM** No Mount	**Asymmetric** **2ME*** Type II Medium **4ME*** Type IV Medium **3ME*** Type III Medium **Symmetric** **5ME** Type V Medium **25D** 25° Flood **5SH** Type V Short **40D** 40° Flood **WSN** Wide Sign **60D** 60° Flood **15D** 15° Flood	**T** 166W **U** 215W	**30K** 3000K **40K** 4000K **57K** 5700K	**UL** Universal 120-277V **UH** Universal 347-480V	**BK** Black **BZ** Bronze **SV** Silver **WH** White	**DIM 0-10V Dimming** - Control by others - Refer to Dimming spec sheet for details - Can't exceed wattage of specified input power designator **F Fuse** - When code dictates fusing, use time delay fuse - Available for U.S. applications only **ML Multi-Level** - Refer to ML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML Programmable Multi-Level, up to 40' Mounting Height** - Refer to PML spec sheet for details - Intended for downlight applications at 0° tilt **PML2 Programmable Multi-Level, 10-30' Mounting Height** - Refer to PML spec sheet for details - Intended for downlight applications at 0° tilt **Q9/Q8/Q7/Q6/Q5/Q4/Q3/Q2/Q1 Field Adjustable Output** - Must select Q9, Q6, Q5, Q4, Q3, Q2, or Q1 for T input power designator - Must select Q9, Q8, Q7, Q6, Q5, Q4, Q3, Q2, or Q1 for U input power designator - Offers full range adjustability - Refer to pages 9-10 for power and lumen values **R NEMA® Photocell Receptacle** - Intended for downlight applications with maximum 45° tilt - 3-pin receptacle per ANSI C136.10 - Photocell and shorting cap by others **RL Rotate Left** - LED and optic are rotated to the left **RR Rotate Right** - LED and optic are rotated to the right

* Available with Backlight Shield when ordered with field-installed accessory (see table above)

Rev. Date: V13 12/19/2017

US: lighting.cree.com T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- Slim, low profile design minimizes wind load requirements
- Luminaire housing is rugged die cast aluminum with an integral, weathertight LED driver compartment and high performance heat sink
- Convenient interlocking mounting method on direct arm mount. Mounting adaptor is rugged die cast aluminum and mounts to 3-6" (76-152mm) square or round pole, secured by two 5/16-18 UNC bolts spaced on 2" (51mm) centers
- Mounting for the adjustable arm mount adaptor is rugged die cast aluminum and mounts to 2" (51mm) IP, 2.375" (60mm) O.D. tenon
- Adjustable arm mount can be adjusted 180˚ in 2.5˚ increments
- Designed for uplight and downlight applications
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, bronze, black, and white are available
- **Weight:** 28.5 lbs. (13kg)

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- When code dictates fusing, a slow blow fuse or type C/D breaker should be used to address inrush current
- **10V Source Current:** 0.15mA

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for wet locations
- Enclosure rated IP66 per IEC 60529 when ordered without R option
- Consult factory for CE Certified products
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets FCC Part 15, Subpart B, Class A standards for conducted and radiated emissions
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- DLC and DLC Premium qualified versions available. Some exceptions apply. Please refer to https://www.designlights.org/search/ for most current information
- RoHS compliant. Consult factory for additional details
- Dark Sky Friendly, IDA Approved when ordered with 30K CCT. Please refer to http://darksky.org/fsa/fsa-products/ for most current information

Electrical Data*

Input Power Designator	System Watts 120-480V	Total Current (A)					
		120V	208V	240V	277V	347V	480V
T	166	1.41	0.83	0.72	0.62	0.49	0.35
U	215	1.83	1.08	0.93	0.81	0.62	0.45

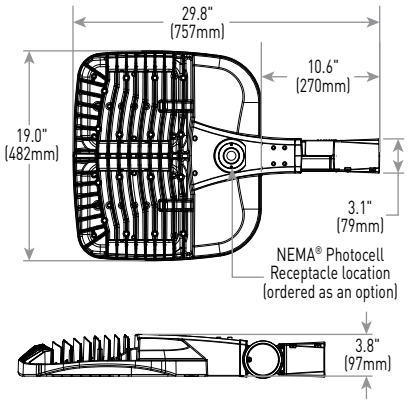
* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-480V +/-10%

OSQ Series Ambient Adjusted Lumen Maintenance[1]

Ambient	Optic	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[2]/ Calculated[3] LMF	100K hr Projected[2]/ Calculated[3] LMF
5˚C (41˚F)	Asymmetric	1.04	1.00	0.95	0.91[3]	0.87[3]
	Symmetric	1.05	1.04	1.03	1.03[2]	1.02[2]
10˚C (50˚F)	Asymmetric	1.03	0.99	0.94	0.90[3]	0.86[3]
	Symmetric	1.04	1.03	1.02	1.01[2]	1.00[2]
15˚C (59˚F)	Asymmetric	1.02	0.98	0.93	0.89[3]	0.86[3]
	Symmetric	1.02	1.02	1.01	1.00[2]	0.99[2]
20˚C (68˚F)	Asymmetric	1.01	0.97	0.93	0.89[3]	0.85[3]
	Symmetric	1.01	1.01	1.00	0.99[2]	0.98[2]
25˚C (77˚F)	Asymmetric	1.00	0.96	0.92	0.88[3]	0.84[3]
	Symmetric	1.00	0.99	0.98	0.98[2]	0.97[2]

[1] Lumen maintenance values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing. Luminaire ambient temperature factors (LATF) have been applied to all lumen maintenance factors
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)

AA Mount

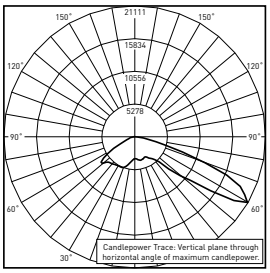


Weight
28.5 lbs. (13kg)

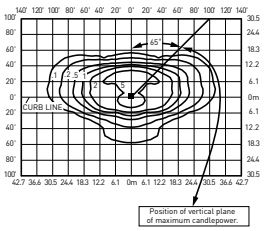
Photometry

All published luminaire photometric testing performed to IESNA LM-79-08 standards by a NVLAP accredited laboratory. To obtain an IES file specific to your project consult: http://lighting.cree.com/products/outdoor/area/osq-series

2ME



CESTL Test Report #: PL07701-001A
OSQ-A-**-2ME-U-40K-UL
Initial Delivered Lumens: 26,946

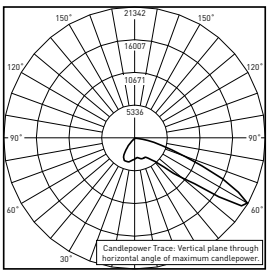


OSQ-A-**-2ME-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 26,583
Initial FC at grade

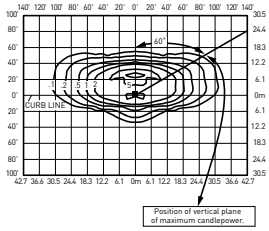
Type II Medium Distribution

Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	20,688	B3 U0 G3	21,902	B3 U0 G3	22,330	B3 U0 G3
U	25,246	B3 U0 G3	26,583	B3 U0 G3	27,103	B3 U0 G3

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt



CESTL Test Report #: PL07700-001A
OSQ-A-**-2ME-U-57K-UL w/OSQ-BLSLF
Initial Delivered Lumens: 22,822



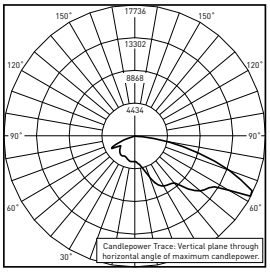
OSQ-A-**-2ME-U-40K-UL w/OSQ-BLSLF
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 20,427
Initial FC at grade

Type II Medium w/BLS Distribution

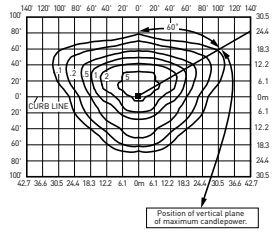
Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	15,897	B2 U0 G2	16,830	B3 U0 G2	17,159	B3 U0 G2
U	19,400	B3 U0 G2	20,427	B3 U0 G2	20,826	B3 U0 G2

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt

3ME



CESTL Test Report #: PL07698-001A
OSQ-A-**-3ME-U-40K-UL
Initial Delivered Lumens: 27,305

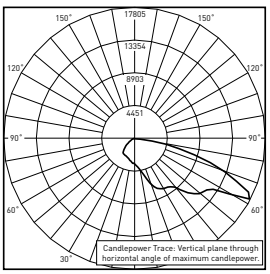


OSQ-A-**-3ME-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 26,583
Initial FC at grade

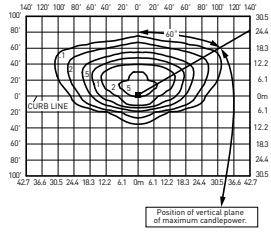
Type III Medium Distribution

Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	20,688	B3 U0 G3	21,902	B3 U0 G3	22,330	B3 U0 G3
U	25,246	B3 U0 G3	26,583	B3 U0 G3	27,103	B3 U0 G3

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt



CESTL Test Report #: PL07699-001A
OSQ-A-**-3ME-U-57K-UL w/OSQ-BLSLF
Initial Delivered Lumens: 23,601



OSQ-A-**-3ME-U-40K-UL w/OSQ-BLSLF
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 20,986
Initial FC at grade

Type III Medium w/BLS Distribution

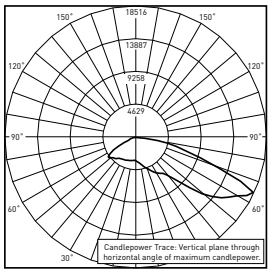
Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	16,333	B2 U0 G2	17,291	B2 U0 G2	17,629	B2 U0 G3
U	19,931	B2 U0 G3	20,986	B2 U0 G3	21,397	B2 U0 G3

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt

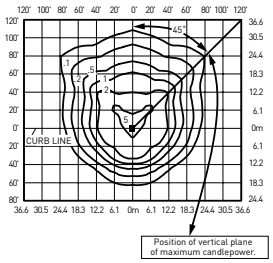
Photometry

All published luminaire photometric testing performed to IESNA LM-79-08 standards by a NVLAP accredited laboratory. To obtain an IES file specific to your project consult: http://lighting.cree.com/products/outdoor/area/osq-series

4ME



CESTL Test Report #: PL07690-001A
OSQ-A-**-4ME-U-40K-UL
Initial Delivered Lumens: 27,527

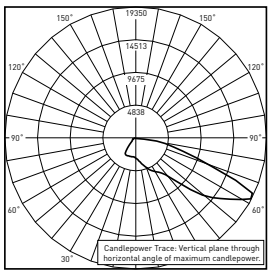


OSQ-A-**-4ME-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 26,583
Initial FC at grade

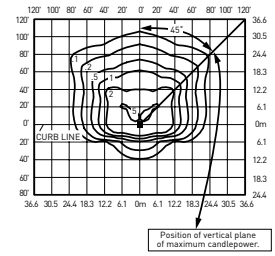
Type IV Medium Distribution

Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	20,688	B3 U0 G3	21,902	B3 U0 G3	22,330	B3 U0 G3
U	25,246	B4 U0 G3	26,583	B4 U0 G3	27,103	B4 U0 G3

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt



CESTL Test Report #: PL07692-001A
OSQ-A-**-4ME-U-57K-UL w/OSQ-BLSLF
Initial Delivered Lumens: 22,793



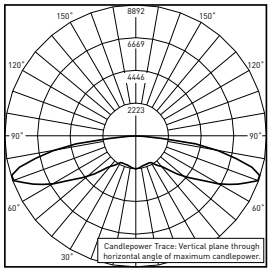
OSQ-A-**-4ME-U-40K-UL w/OSQ-BLSLF
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 20,427
Initial FC at grade

Type IV Medium w/BLS Distribution

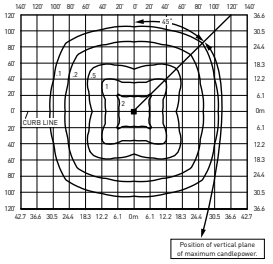
Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	15,897	B2 U0 G3	16,830	B2 U0 G3	17,159	B2 U0 G3
U	19,400	B3 U0 G3	20,427	B3 U0 G3	20,826	B3 U0 G3

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt

5ME



CESTL Test Report #: PL07882-001A
OSQ-A-**-5ME-U-30K-UL
Initial Delivered Lumens: 21,410



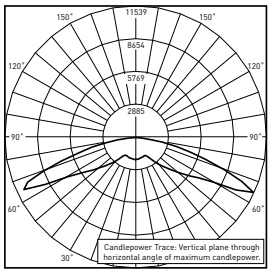
OSQ-A-**-5ME-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 24,666
Initial FC at grade

Type V Medium Distribution

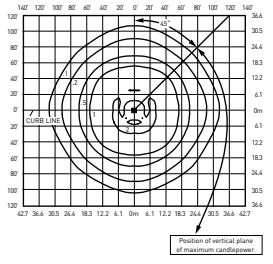
Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Pe TM-15-11
T	18,544	B4 U0 G5	21,469	B5 U0 G5	21,842	B5 U0 G5
U	21,305	B5 U0 G5	24,666	B5 U0 G5	25,095	B5 U0 G5

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt

5SH



CESTL Test Report #: PL0754-001A
OSQ-A-**-5SH-U-40K-UL
Initial Delivered Lumens: 25,679



OSQ-A-**-5SH-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 26,051
Initial FC at grade

Type V Short Distribution

Input Power Designator	3000K		4000K		5700K	
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11
T	19,586	B5 U0 G3	22,675	B5 U0 G3	23,069	B5 U0 G3
U	22,502	B5 U0 G3	26,051	B5 U0 G3	26,504	B5 U0 G4

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit: https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf. Valid with no tilt

Photometry

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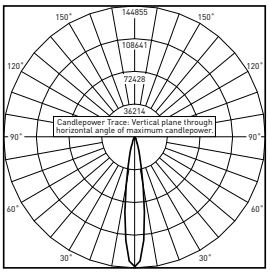
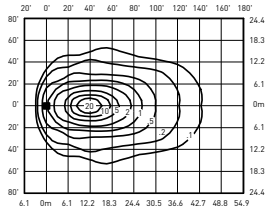
15D



CESTL Test Report #: PL07689-001A
OSQ-A-**-15D-U-30K-UL
Initial Delivered Lumens: 23,254

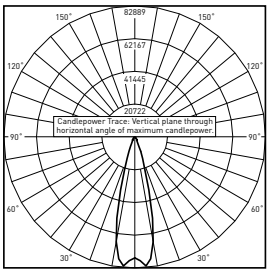


OSQ-A-**-15D-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G., 60° Tilt
Initial Delivered Lumens: 26,051
Initial FC at grade

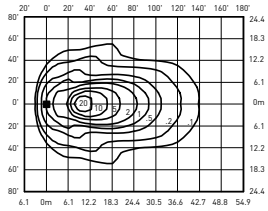
15° Flood Distribution			
Input Power Designator	3000K	4000K	5700K
	Initial Delivered Lumens*	Initial Delivered Lumens*	Initial Delivered Lumens*
T	19,586	22,675	23,069
U	22,502	26,051	26,504

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens

25D



CESTL Test Report #: PL07687-001A
OSQ-A-**-25D-U-30K-UL
Initial Delivered Lumens: 23,265

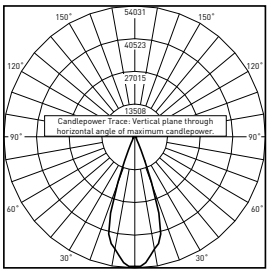


OSQ-A-**-25D-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G., 60° Tilt
Initial Delivered Lumens: 26,051
Initial FC at grade

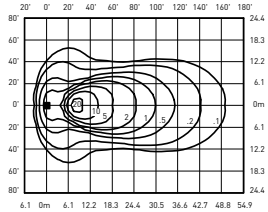
25° Flood Distribution			
Input Power Designator	3000K	4000K	5700K
	Initial Delivered Lumens*	Initial Delivered Lumens*	Initial Delivered Lumens*
T	19,586	22,675	23,069
U	22,502	26,051	26,504

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens

40D



CESTL Test Report #: PL07697-001A
OSQ-A-**-40D-U-30K-UL
Initial Delivered Lumens: 22,943



OSQ-A-**-40D-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G., 60° Tilt
Initial Delivered Lumens: 26,051
Initial FC at grade

40° Flood Distribution			
Input Power Designator	3000K	4000K	5700K
	Initial Delivered Lumens*	Initial Delivered Lumens*	Initial Delivered Lumens*
T	19,586	22,675	23,069
U	22,502	26,051	26,504

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens

Photometry

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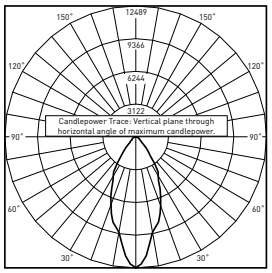
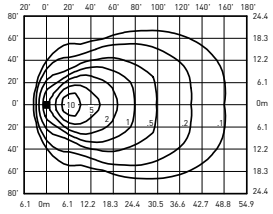
60D



CESTL Test Report #: PL08100-001B
OSQ-A-**-60D-B-30K-UL
Initial Delivered Lumens: 10,079

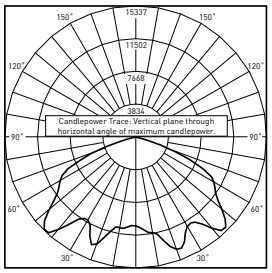


OSQ-A-**-60D-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G., 60° Tilt
Initial Delivered Lumens: 26,051
Initial FC at grade

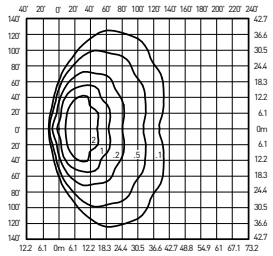
60° Flood Distribution			
Input Power Designator	3000K	4000K	5700K
	Initial Delivered Lumens*	Initial Delivered Lumens*	Initial Delivered Lumens*
T	19,586	22,675	23,069
U	22,502	26,051	26,504

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens

WSN



CESTL Test Report #: PL07695-001A
OSQ-A-**-WSN-U-30K-UL
Initial Delivered Lumens: 23,116



OSQ-A-**-WSN-U-40K-UL
Mounting Height: 25' (7.6m) A.F.G., 60° tilt
Initial Delivered Lumens: 26,051
Initial FC at grade

Wide Sign Distribution			
Input Power Designator	3000K	4000K	5700K
	Initial Delivered Lumens*	Initial Delivered Lumens*	Initial Delivered Lumens*
T	19,586	22,675	23,069
U	22,502	26,051	26,504

* Initial delivered lumens at 25°C (77°F). Actual production yield may vary between -10 and +10% of initial delivered lumens

Luminaire EPA

Fixed Arm Mount – OSQ-DA Weight: 28.5 lbs. (13kg)					
Single	2 @ 180˚	2 @ 90˚	3 @ 90˚	3 @ 120˚	4 @ 90˚
0.80	1.61	1.26	2.06	1.68	2.52

Adjustable Arm Mount – OSQ-AA Weight: 28.5 lbs. (13kg)							
Single	2 @ 180˚	2 @ 90˚	3 @ 90˚	3 @ 120˚	3 @ 180˚	4 @ 180˚	4 @ 90˚
Tenon Configuration (0˚-80˚ Tilt); If used with Cree tenons, please add tenon EPA with Luminaire EPA							
PB-1A*; PT-1; PW-1A3**	PB-2A*; PB-2R2.375; PD-2A4(180); PT-2(180); PW-2A3**	PB-2A*; PD-2A4(90); PT-2(90)	PB-3A*; PD-3A4(90); PT-3(90)	PB-3A*; PT-3(120)	PB-3A*; PB-3R2.375	PB-4A*(180)	PB-4A*(90); PB-4R2.375; PD-4A4(90); PT-4(90)
0˚ Tilt							
0.80	1.61	1.26	2.06	1.68	3.33	4.66	2.52
10˚ Tilt							
0.81	1.61	1.62	2.42	2.32	4.40	6.08	3.24
20˚ Tilt							
1.24	1.61	2.04	2.84	3.13	5.68	7.80	4.08
30˚ Tilt							
1.64	1.64	2.44	3.24	3.97	6.88	9.40	4.88
45˚ Tilt							
2.20	2.20	3.00	3.80	5.07	8.55	11.64	6.00
60˚ Tilt							
2.63	2.63	3.43	4.23	5.73	9.84	13.36	6.86
70˚ Tilt							
2.82	2.82	3.62	4.42	5.73	10.41	14.12	7.24
80˚ Tilt							
2.93	2.93	3.73	4.53	5.73	10.74	14.56	7.46
Tenon Configuration (90˚ Tilt); If used with Cree tenons, please add tenon EPA with Luminaire EPA							
PB-1A*; PT-1; PW-1A3**	PB-2A*; PB-2R2.375; PD-2A4(180); PT-2(180); PW-2A3**	PB-2A*	PB-3A*	PB-3A*; PT-3(120)	PB-3A*; PB-3R2.375	PB-4A*(180)	PB-4A*(90); PB-4R2.375
90˚ Tilt							
2.95	2.95	4.84	6.52	5.73	10.81	14.64	11.19

* Specify pole size: 3 (3"), 4 (4"), 5 (5"), or 6 (6") for single, double or triple luminaire orientation or 4 (4"), 5 (5"), or 6 (6") for quad luminaire orientation
** These EPA values must be multiplied by the following ratio: Fixture Mounting Height/Total Pole Height. Specify pole size: 3 (3"), 4 (4"), 5 (5"), or 6 (6")

Tenon EPA

Part Number	EPA
PB-1A*	None
PB-2A*	0.82
PB-3A*	1.52
PB-4A*(180)	2.22
PB-4A*(90)	1.11
PB-2R2.375	0.92
PB-3R2.375	1.62
PB-4R2.375	2.32
PD Series Tenons	0.09
PT Series Tenons	0.10
PW-1A3**	0.47
PW-2A3**	0.94
WM-2	0.08
WM-4	0.25
WM-DM	None

* Specify pole size: 3 (3"), 4 (4"), 5 (5"), or 6 (6") for single, double or triple luminaire orientation or 4 (4"), 5 (5"), or 6 (6") for quad luminaire orientation
** These EPA values must be multiplied by the following ratio: Fixture Mounting Height/Total Pole Height. Specify pole size: 3 (3"), 4 (4"), 5 (5"), or 6 (6")

Tenons and Brackets‡ (must specify color)

Square Internal Mount Vertical Tenons (Steel)
- Mounts to 3-6" (76-152mm) square aluminum or steel poles

PB-1A* – Single
PB-2A* – 180˚ Twin
PB-3A* – 180˚ Triple
PB-4A*(90) – 90˚ Quad
PB-4A*(180) – 180˚ Quad

Square Internal Mount Horizontal Tenons (Aluminum)
- Mounts to 4" (102mm) square aluminum or steel poles

PD-2A4(90) – 90˚ Twin
PD-2A4(180) – 180˚ Twin
PD-3A4(90) – 90˚ Triple
PD-4A4(90) – 90˚ Quad

Wall Mount Brackets
- Mounts to wall or roof

WM-2 – Horizontal for OSQ-AA mount
WM-4 – L-Shape for OSQ-AA mount
WM-DM – Plate for OSQ-DA mount

Round External Mount Vertical Tenons (Steel)
- Mounts to 2.375" (60mm) O.D. round aluminum or steel poles or tenons

PB-2R2.375 – Twin
PB-3R2.375 – Triple
PB-4R2.375 – Quad

Round External Mount Horizontal Tenons (Aluminum)
- Mounts to 2.375" (60mm) O.D. round aluminum or steel poles or tenons
- Mounts to square pole with PB-1A* tenon

PT-1 – Single (Vertical)
PT-2(90) – 90˚ Twin
PT-2(180) – 180˚ Twin
PT-3(90) – 90˚ Triple
PT-4(90) – 90˚ Quad

Mid-Pole Bracket
- Mounts to square pole

PW-1A3** – Single
PW-2A3** – Double

Ground Mount Post
- For ground mounted flood luminaires

PGM-1 - for OSQ-AA mount

‡ Refer to the Bracket and Tenons spec sheet for more details

Direct Mount Configurations

Compatibility with OSQ-DA Direct Mount Bracket					
Input Power Designator	2 @ 90˚	2 @ 180˚	3 @ 90˚	3 @ 120˚	4 @ 90˚
3" Square					
T & U	N/A	✓	N/A	N/A	N/A
3" Round					
T & U	N/A	✓	N/A	N/A	N/A
4" Square					
T & U	✓	✓	✓	N/A	✓
4" Round					
T & U	✓	✓	✓	✓	✓
5" Square					
T & U	✓	✓	✓	N/A	✓
5" Round					
T & U	✓	✓	✓	✓	✓
6" Square					
T & U	✓	✓	✓	N/A	✓
6" Round					
T & U	✓	✓	✓	✓	✓

Field Adjustable Output (Q9/Q6/Q5/Q4/Q3/Q2/Q1) Option Description:

The Field Adjustable Output option enables the OSQ area luminaires to be tuned to the exact needs of a particular application through multiple levels of adjustment. When ordered with the Q option, the luminaire will be shipped from the factory at the selected Q setting and will be fully adjustable between the nine settings.

Q Option Power & Lumen Data – Designator T

Q Option Setting	CCT/CRI	System Watts	Lumen Values						Optics Qualified on DLC QPL	
		120-480V	Asymmetric	5ME	5SH & Floods	2ME w/BLS	3ME w/BLS	4ME w/BLS	Standard	Premium
Q9 (Full Power)	30K	166	20,688	18,544	19,586	15,897	16,333	15,897	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		21,902	21,469	22,675	16,830	17,291	16,830	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		22,330	21,842	23,069	17,159	17,629	17,159	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
Q6	30K	151	18,826	16,875	17,823	14,466	14,863	14,466	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		19,931	19,537	20,634	15,315	15,735	15,315	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		20,320	19,876	20,993	15,615	16,042	15,615	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
Q5	30K	135	16,964	15,206	16,061	13,036	13,393	13,036	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		17,960	17,605	18,594	13,801	14,179	13,801	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		18,311	17,910	18,917	14,070	14,456	14,070	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
Q4	30K	115	15,102	13,537	14,298	11,605	11,923	11,605	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		15,988	15,672	16,553	12,286	12,622	12,286	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		16,301	15,945	16,840	12,526	12,869	12,526	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
Q3	30K	96	13,033	11,683	12,339	10,015	10,290	10,015	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		13,798	13,525	14,285	10,603	10,893	10,603	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		14,068	13,760	14,533	10,810	11,106	10,810	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
Q2	30K	79	10,551	9,457	9,989	8,107	8,330	8,107	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		11,170	10,949	11,564	8,583	8,818	8,583	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		11,388	11,139	11,765	8,751	8,991	8,751	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
Q1/	30K	58	8,689	7,788	8,226	6,677	6,860	6,677	5ME, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME, 5SH
	40K		9,199	9,017	9,524	7,069	7,262	7,069	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN
	57K		9,379	9,174	9,689	7,207	7,404	7,207	N/A	2ME, 3ME, 4ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN

Field Adjustable Output (Q9/Q8/Q7/Q6/Q5/Q4/Q3/Q2/Q1) Option Description:

The Field Adjustable Output option enables the OSQ area luminaires to be tuned to the exact needs of a particular application through multiple levels of adjustment. When ordered with the Q option, the luminaire will be shipped from the factory at the selected Q setting and will be fully adjustable between the nine settings.

Q Option Power & Lumen Data – Designator U

Q Option Setting	CCT/CRI	System Watts	Lumen Values						Optics Qualified on DLC QPL	
		120-480V	Asymmetric	5ME	5SH & Floods	2ME w/BLS	3ME w/BLS	4ME w/BLS	Standard	Premium
Q9 (Full Power)	30K	215	25,246	21,305	22,502	19,400	19,931	19,400	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		26,583	24,666	26,051	20,427	20,986	20,427	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		27,103	25,095	26,504	20,826	21,397	20,826	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q8	30K	191	23,226	19,601	20,702	17,848	18,337	17,848	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		24,456	22,693	23,967	18,793	19,307	18,793	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		24,935	23,087	24,384	19,160	19,685	19,160	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q7	30K	171	21,207	17,896	18,902	16,296	16,742	16,296	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		22,330	20,719	21,883	17,159	17,628	17,159	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		22,767	21,080	22,263	17,494	17,973	17,494	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q6	30K	152	19,439	16,405	17,327	14,938	15,347	14,938	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		20,469	18,993	20,059	15,729	16,159	15,729	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		20,869	19,323	20,408	16,036	16,476	16,036	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q5	30K	133	17,672	14,914	15,751	13,580	13,952	13,580	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		18,608	17,266	18,236	14,299	14,690	14,299	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		18,972	17,567	18,553	14,578	14,978	14,578	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q4	30K	113	15,400	12,996	13,726	11,834	12,158	11,834	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		16,216	15,046	15,891	12,460	12,801	12,460	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		16,533	15,308	16,167	12,704	13,052	12,704	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q3	30K	94	13,128	11,079	11,701	10,088	10,364	10,088	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		13,823	12,826	13,547	10,622	10,913	10,622	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		14,094	13,049	13,782	10,830	11,126	10,830	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q2	30K	77	11,108	9,374	9,901	8,536	8,770	8,536	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		11,697	10,853	11,462	8,988	9,234	8,988	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		11,925	11,042	11,662	9,163	9,415	9,163	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
Q1	30K	53	7,574	6,392	6,751	5,820	5,979	5,820	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME
	40K		7,975	7,400	7,815	6,128	6,296	6,128	3ME, 5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 4ME
	57K		8,131	7,529	7,951	6,248	6,419	6,248	5ME, 5SH, 15D, 25D, 40D, 60D, WSN	2ME, 3ME, 4ME

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US: lighting.cree.com T (800) 236-6800 F (262) 504-5415 **Canada: www.cree.com/canada** T (800) 473-1234 F (800) 890-7507

ZR-T TrueWhite® Series

ZR22™ 2' x 2' TrueWhite® Series LED Troffer with Gloss Finish

Product Description

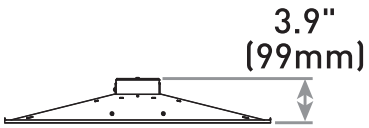
The ZR-T TrueWhite® LED troffer delivers 3200 lumens of superior 90+ CRI light quality and is perfect for both new construction and renovation. Powered by Cree TrueWhite® Technology, the slim and lightweight ZR-T LED troffer boasts an efficacious 100 LPW along with 0-10V dimming to meet local energy codes. The ZR22™ LED troffer embodies a breakthrough in balancing energy savings, visual comfort and initial cost.

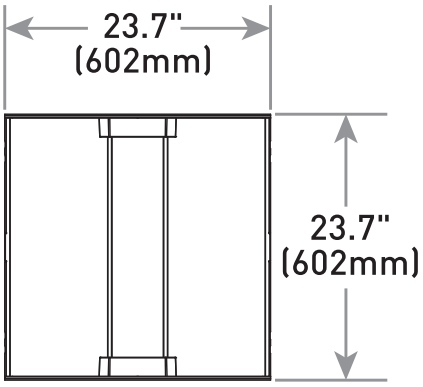
Performance Summary

- Utilizes Cree TrueWhite® Technology
- **Efficacy:** 100 LPW
- **Initial Delivered Lumens:** 3,200 lumens
- **Input Power:** 32 watts
- **CRI:** 90+ CRI
- **CCT:** 3000K, 3500K, 4000K, 5000K
- **Input Voltage:** 120-277 VAC or 347 VAC
- **Limited Warranty†:** 10 years on luminaire
- **Limited Warranty Emergency Back Up (EB) Battery**: 1 Year on Battery Back Up. Test regularly in accordance with local codes
- **Controls:** 0-10V dimming to 5%
- **Mounting:** Recessed*
- Room-side accessible snap and lock removable lens

† See http://lighting.cree.com/warranty for warranty terms

* Not intended for use with 9/16" T-Bar grids unless used with a 9/16" accessory clip like "Armstrong® LFC- Fixture Clip" which can be purchased through distribution. Consult factory for non-standard grid applications.





Accessories

Field-Installed	
Drywall Grid Adapter DGA22-WHT **Surface Mount Kit** SMK-ZR22 - Not for use with EB14 or SmartCast® Technology **6' Flexible Power Whip** PW-18/4-06-9T/SS - For use in non-dimming applications only	**Wireless 0-10V Dimming/Switching Interface with Cree Smartcast® Technology** CIF-10V-CWC-SNSR - For use with luminaires with 10V controls when integral SmartCast isn't available **Cree SmartCast® Technology Configuration Tool** CCT-CWC-1 - One required per project when CIF-10V is selected **Chicago Plenum Field Kit** CPLZR - Fits all ZR types to be installed in the field

Ordering Information

Example: ZR22T-32L-35K-10V

ZR22T	32L			10V	
Product	**Initial Delivered Lumens**	**CCT**	**Voltage**	**Control**	**Options**
ZR22T	**32L** 32W, 3,200 Lumens	**30K** 3000K **35K** 3500K **40K** 4000K **50K** 5000K	**Blank** 120-277 Volt **34** 347 Volt	**10V** 0-10V dimming to 5%	**EB14 Emergency Backup** - 1,400 lumens - Not available with 347 Volt - Provides 90 minutes of emergency operation

Rev. Date: V2 05/04/2017

US: lighting.cree.com T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CREE TRUEWHITE® TECHNOLOGY

A revolutionary way to generate high-quality white light, Cree TrueWhite® Technology is a patented approach that delivers an exclusive combination of 90+ CRI, beautiful light characteristics, and lifelong color consistency, all while maintaining high luminous efficacy – a true no compromise solution.

CONSTRUCTION & MATERIALS

- Durable 22 ga. cold rolled steel housing provides strength and uniformity
- Ultra-thin 3.9" (99mm) luminaire height and lightweight design effectively target a broad range of plenum spaces and allow for easy installations
- Luminaire is pre-painted for enhanced smooth finish
- Includes t-bar clips and holes for mounting support wires (by others)
- Luminaire sides and ends are hemmed in for safe, easy handling
- Includes lens gasket to prevent ingress of insects
- Not for installation within 3" (76mm) of insulation
- Removable lens for easy maintenance and cleaning
- Magnetic lens to prevent dust and bug intrusion

OPTICAL SYSTEM

- Unique luminaire design creates perfect balance of both horizontal and vertical illumination
- Optimized smooth acrylic lens eliminates pixelation and delivers a low-glare, diffused light distribution

ELECTRICAL SYSTEM

- Cree born components including highly efficacious Cree® LED chips along with an integral high-efficiency Cree® driver
- **Power Factor:** = 0.9 nominal for 120-277V
- **Input Power:** Stays constant over life
- **Input Voltage:** 120-277V or 347V, 60Hz
- **Operating Temperature Range:** 0˚C - + 35˚C (32˚F - + 95˚F)
- **Total Harmonic Distortion:** < 20% for standard fixtures; < 25% for EB option

CONTROLS

- Continuous dimming to 5% with 0-10V DC control protocol
- **10V Source Current:** 0.25mA
- For use with Class 2 dimming systems only
- Use only lighting controls with neutral connection or controls intended for use with LED fixtures
- Reference www.creelink.com/exLink.asp?7098214OZ58R34I26620963 for recommended dimming controls and wiring diagrams

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for damp locations
- Designed for indoor use
- UL924 (EB option). Maximum mounting height: 15.0' (4.6m)
- RoHS compliant. Consult factory for additional details
- Meets FCC Part 15, Subpart B, Class A standards for conducted and radiated emissions
- DLC qualified. Please refer to www.designlights.org/QPL for most current information

Electrical Data*

Initial Delivered Lumens	System Watts 120-347V	Total Current (A)				
		120V	208V	240V	277V	347V
32L	32	0.25	0.16	0.14	0.12	0.10
32L w/EB14 Option	36	0.32	0.19	0.17	0.14	0.12

* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-347V +/- 10%

Recommended ZR-T Series Lumen Maintenance Factors (LMF)[1]

Ambient	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Calculated[3] LMF	100K hr Calculated[3] LMF
0˚C (32˚F)	1.04	1.04	1.04	1.04	1.04
5˚C (41˚F)	1.03	1.03	1.03	1.03	1.03
10˚C (50˚F)	1.02	1.02	1.02	1.02	1.02
15˚C (59˚F)	1.02	1.02	1.02	1.02	1.02
20˚C (68˚F)	1.01	1.01	1.01	1.01	1.01
25˚C (77˚F)	1.00	1.00	1.00	1.00	1.00
30˚C (86˚F)	0.99	0.99	0.99	0.99	0.99
35˚C (95˚F)	0.98	0.98	0.98	0.98	0.98

[1] Lumen maintenance values at 25˚C are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)

Application Reference

Open Space

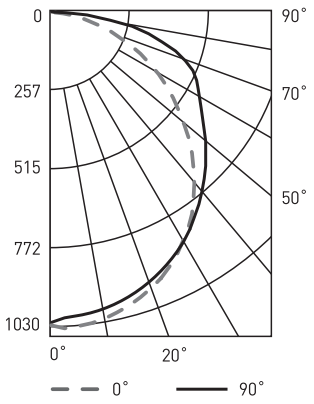
Spacing	Lumens	Wattage	LPW	w/ft²	Average fc
8 x 8	3,200	32	100	0.48	45
8 x 10				0.40	38
10 x 10				0.32	30
10 x 12				0.26	24

10' ceiling: 80/50/20 reflectances; 2.5' workplane, open room. LLF: 1.0 Initial Open Space: 50' x 40' x 10'

Photometry

ZR22T-32L-30K -10V BASED ON DTC REPORT TEST #: PL10546-001

Luminaire photometry has been conducted by a NVLAP accredited testing laboratory in accordance with IESNA LM-79-08. IESNA LM-79-08 specifies the entire luminaire as the source resulting in a luminaire efficiency of 100%.



Coefficients Of Utilization – Zonal Cavity Method				
RC %:	80			
RW %:	70	50	30	10
RCR: 0	119	119	119	119
1	108	102	98	93
2	97	88	81	75
3	88	77	68	62
4	81	68	59	52
5	74	61	51	44
6	68	54	45	39
7	63	49	40	34
8	59	45	36	30
9	55	41	33	27
10	52	38	30	25

Effective Floor Cavity Reflectance: 20%

Zonal Lumen Summary			
Zone	Lumens	% Lamp	Luminaire
0-30	791	N/A	25.3%
0-40	1,294	N/A	41.4%
0-60	2,308	N/A	73.8%
0-90	3,127	N/A	100%
0-180	3,127	N/A	100%

Average Luminance Table (cd/m²)				
Vertical Angle	Horizontal Angle			
	0°	45°	90°
45°	13,826	14,649	15,216
55°	12,758	14,590	15,944
65°	11,451	15,430	18,755
75°	9,523	17,908	21,834
85°	6,777	17,451	20,038

Reference http://lighting.cree.com/products/indoor/troffers/zr-series for detailed photometric data

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CREE™

LED 40/60/75w

A19 REPLACEMENTS

WE BELIEVE IN BETTER LIGHT™

SUGGESTED USE:

OMNIDIRECTIONAL LIGHT SOURCE

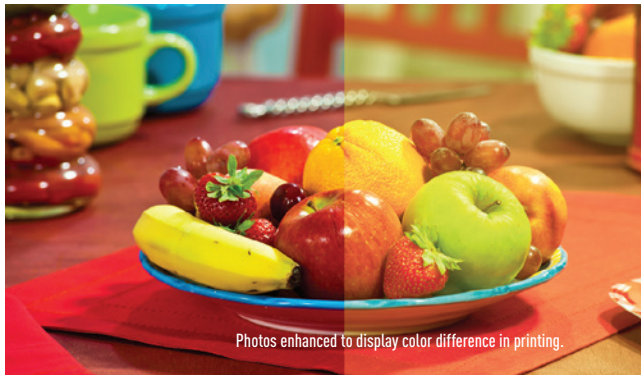
Better light is beautiful light; it makes colors appear richer, true and natural.

Choose better.

At Cree®, we believe in better lighting. Better light is beautiful light. But it's more than just beautiful. It is light that makes you feel more productive, more relaxed and safer. Better light changes everything.

That's why the new and improved Cree LED bulbs feature high color rendering that enhances your space and makes the colors of your décor appear vibrant, richer and more natural – true colors the way they are meant to be experienced.

Cree Light | Other Light



CREE 40, 60 & 75W REPLACEMENT LED LIGHT BULBS

	40-Watt Soft White/Daylight Replacement	60-Watt Soft White/Daylight Replacement	75-Watt Soft White/Daylight Replacement
Color Temperature (K)	2700/5000	2700/5000	2700/5000
Lumens	465/470	815/820	1130/1150
Energy Used (Watts)	5.5/5	9.5/8.5	11.2/10.2
Annual Savings†	$4.16/$4.22	$6.08/6.20	$7.68/$7.81
Color Rendering Index	85+	85+	85+
Rated Life (Hours)	35,000	35,000	35,000
Beam Spread	Omnidirectional	Omnidirectional	Omnidirectional
Bulb Size	A19	A19	A19

† At $0.11 per kWh when compared to 40W/60W/75W incandescent. 25,000 hour lifetime

What makes them better?

Unlike some others, Cree doesn't compromise.

85+ CRI — **High color rendering**
Better light for better colors

Longer LED lifetime lasts 32 years (35,000 hours)
Up to 7x as long as the cheap LED bulbs

5 year commercial use warranty
Better light lasts longer and saves your more

Dimmable. No buzz. No hum.
For a list of compatible dimmers visit creebulb.com/dimmers

Omnidirectional light source
Shines up, down and all-around like a light bulb should

ENERGY STAR® qualified
For high performance and superior energy efficiency

CREE™ lighting.cree.com

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CAT/SSHT-C077 Rev. Date: 04/24/2017

866.924.3645 lighting.cree.com

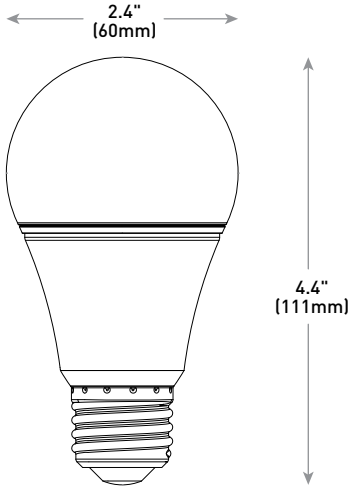
A19 Series

LED Lamps

Product Description

At Cree®, we believe in better lighting. Better light is beautiful light. But it's more than just beautiful. It is light that makes you feel more productive, more relaxed and safer. Better light changes everything. That's why the new and improved Cree LED bulbs feature high color rendering that enhances your space and makes the colors of your décor appear vibrant, richer and more natural – true colors the way they are meant to be experienced.

The Cree® LED A19 bulbs deliver up to 1,150 lumens of soft white 2700K light or 5000K daylight, while consuming at least 84% less energy than the incandescent bulbs they replace. These lamps feature a consistent and balanced omnidirectional light source, turn on instantly, and are compatible with most standard incandescent dimmers; no buzz, no hum. The Cree® LED A19 bulbs are ENERGY STAR® certified and are designed to last 35,000 hours.



Performance Summary

Lamp Delivered Light Output: 465-1,150 lumens

Input Power: 5.0-5.5 watts (40W equivalent); 8.5-9.5 watts (60W equivalent); 10.2-11.2 watts (75W equivalent)

CRI: 85

CCT: 2700K, 5000K

Limited Warranty†: 5 years Commercial use

Lifetime: Designed to last at least 35,000 hours

Dimming: Dimmable to 5% with select dimmers

ENERGY STAR® Certified

Must order in multiples of master carton (MC) quantities; MC = (24) Single-Lamp Cartons

† See http://lighting.cree.com/warranty for warranty terms

Ordering Information

Example: A19-40W-27K-U1

A19						U1
Product	**Watt Equivalent**	**CCT**	**Voltage**	**Base**	**CRI**	**Packaging**
A19	**40W** 40 Watt, 465-470 lumens **60W** 60 Watt, 815-820 lumens **75W** 75 Watt, 1,130-1,150 lumens	**27K** 2700K **50K** 5000K	**Blank** 120 Volt	**Blank** E26 (screw base)	**Blank** 85	**U1 Single-Lamp Carton** Master Carton = (24) Single-Lamp Cartons

US: lighting.cree.com T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- 40 & 60W A-type bulb design weighs 3.0 ounces (86g)
- 75W A-type bulb design weighs 5.1 ounces (145.0g)
- Bulb meets ANSI standards for A19 dimensions
- Uses a standard E26 screw base
- Mercury free
- **Dimensions:** 4.5" H x 2.375" W x 2.375" D (Single-Lamp Carton); 5.0" H x 10.125" W x 15.0" D (Master Carton)

OPTICAL SYSTEM

- Omnidirectional light distribution
- Plastic globe offers increased optical spread

ELECTRICAL SYSTEM

- **Power Factor:** > 0.9 nominal
- **Input Voltage:** 120V, 60Hz
- **Dimming:** Dimmable to 5% with select dimmers. Refer to https://www.creelink.com/viewcontent.asp?qv=1&docid=5344 for additional details
- **Operating Temperature Range:** -25˚C - +45˚C (-13˚F - +113˚F)

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for damp locations, but not for use where exposed directly to weather or water
- Do not use in enclosed fixtures
- Meets FCC Part 15, Subpart B, Class B standards for conducted and radiated emissions
- ENERGY STAR® certified. Please refer to http://www.energystar.gov/productfinder/product/certified-light-bulbs/ results for most current information
  A19-40W-27K-U1
  A19-40W-50K-U1
  A19-60W-27K-U1
  A19-60W-50K-U1
  A19-75W-27K-U1
  A19-75W-50K-U1
- RoHS compliant. Consult factory for additional details

Packaging

(24) Single-Lamp Cartons in Master Carton (24 Total Lamps)

Ordering Number	Single-Lamp Carton UPC	Description	Bulb Type	Watts	CCT	Single-Lamp Cartons per Master Carton	Master Carton ITF-14	Total Lamps per Master Carton	Master Cartons per Pallet Qty	CRI	Lumens	Rated Life (Hrs)
A19-40W-27K-U1	849665017516	40W Soft White A19 Equivalent	A19	5.5	2700K	24	10849665017513	24	80	85	465	35,000
A19-40W-50K-U1	849665017523	40W Daylight A19 Equivalent	A19	5.0	5000K	24	10849665017520	24	80	85	470	35,000
A19-60W-27K-U1	849665017530	60W Soft White A19 Equivalent	A19	9.5	2700K	24	10849665017537	24	80	85	815	35,000
A19-60W-50K-U1	849665017547	60W Daylight A19 Equivalent	A19	8.5	5000K	24	10849665017544	24	80	85	820	35,000
A19-75W-27K-U1	849665017554	75W Soft White A19 Equivalent	A19	11.2	2700K	24	10849665017551	24	80	85	1,130	35,000
A19-75W-50K-U1	849665017561	75W Daylight A19 Equivalent	A19	10.2	5000K	24	10849665017568	24	80	85	1,150	35,000

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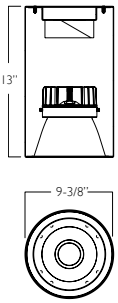
SCH8-LED 8” ARCHITECTURAL CYLINDER LED DOWNLIGHT & UP/DOWNLIGHT

Catalog Number	SCH8-LED-WM-3000L-DIM10-120-WD-85-HH8-8501-CL-WH
Project Name	Type

SAME DAY SHIPPING AVAILABLE

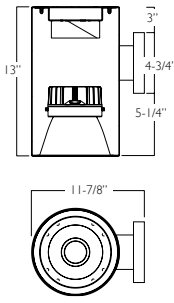
NEW



SCH8-LED-CM

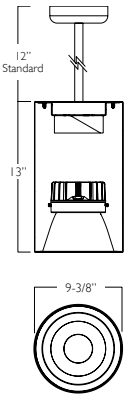
4000 LUMENS

SCH8-LED-WM

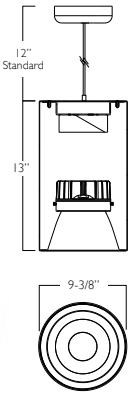


SCH8-LED-UWM

SCH8-LED-PM



SCH8-LED-SM



INPUT VOLT.	INPUT FREQ.	INPUT CUR.	THD	POWER FACTOR	INPUT POWER	LUMENS
120/277	50/60Hz	408mA/176mA	<20%	>0.9	49W(+/-5%)	4000
120/277	50/60Hz	383mA/166mA	<20%	>0.9	40W(+/-5%)	3000
120/277	50/60Hz	266mA/115mA	<20%	>0.9	32W(+/-5%)	2000
120/277	50/60Hz	200mA/86mA	<20%	>0.9	24W(+/-5%)	1200
120/277	50/60Hz	150mA/65mA	<20%	>0.9	16W(+/-5%)	900

DESCRIPTION - 8” LED Architectural Cylinder Downlight with integral LED heat management casting and driver (installed on junction box). Available in 900 lumens, 1200 lumens, 2000 lumens, 3000 lumens & 4000 lumens. Lighting is smooth and comfortable while using 50% less energy than the common CFL downlight. Plus the eco-friendly MAXILUME LED system features 70% lumen maintenance at 50,000hrs of life, with Energy Star and California Title-24 (compliances pending).

FEATURES - MAXILUME LED luminaires are ideally suited for use in hospitality, health care, commercial, academic institutions, retail and other architectural applications.

PROUDLY ASSEMBLED in AMERICA

c UL us LISTED

c ETL us Intertek

ENERGY STAR PENDING

OPTICS - MAXILUME LED Optilux technology combines unmatched performance with visual comfort. Spun 0.05” thick reflector has been designed to gather the light scattered by the LED chip and shape it into functional beams that minimize brightness and glare, while eliminating lamp image. Reflector offers a 55 degree cutoff and smooth frost acrylic diffuser distributes light even throughout the workplace.

PERFORMANCE - Operating system delivers 900 lumens, 1200 lumens, 2000 lumens, 3000 lumens & 4000 lumens. All MAXILUME LED luminaries are rated at 85+, 90+ and 98+ CRI. Elite’s highly selective LED chips produce zero ultraviolet and virtually no infrared light. All LED luminaries are rated and tested to LM-79 and LM-80 standards by an independent laboratory.

THERMAL MANAGEMENT SYSTEM - Using a proprietary cooLED Advanced Thermodynamic Design, Die-cast aluminum housing and heat management system are engineered for extremely long life and service period. Heat sink is attached to top of housing. The LED light engine is attached to the die-cast heat sink and is easily replaceable and upgradable. Life tests have shown the MAXILUME light engine output will be maintained at 70% of initial at 50,000hrs of operation.

DIMMABLE - The MAXILUME LED system is fully dimmable down to 1% of initial light output with a 0-10 Volt dimmer when ordered with the following options (DIM10-120, DIM10-277). Fixtures can be shipped with a Lutron Hi-lume A series Driver which can be dimmed with Lutron Dimming Systems when ordered with the following options (120-LUTH, 277-LUTH). Triac & Electronic Low Voltage dimming driver also available when ordered with the following options (DIMTR-120). Consult Factory for details. All fixtures with 3000L and below are dimmable down to 1% and the fixtures with 4000L and above can be dimmed down to 10%.

BODY - Post painted die-formed construction for maximum heat dissipation and rust protection. Matte white finish standard.

LED DRIVER/JUNCTION BOX - The LED driver is rated for 50 to 60Hz at 120V /277V input, produces less than 20%THD, and has a power factor between 90% and 100% and is thermally protected for additional safety. MAXILUME’s LED driver is installed on the junction box cover so it may be serviced from below the ceiling. UL Listed for through-branch circuit wiring, provided with four 1/2” knockouts, one 3/4” knockout and four Romex knockouts with true pry out slots and strain clamps.

MOUNTING BRACKET - Ceiling mount bracket provided for direct installation with 3-1/4” to 4” octagonal and square junction box. Pendant mount option is available and supplied with 10-1/2” stem and 5” diameter canopy cover. Ideal for slope applications up to 45 degrees. Suspended mount option is also available supplied with aircraft adjustable cable.

OUR WORD - The MAXILUME LED lighting system carries a five-year carefree warranty for parts and components. (Labor not included.)

LISTING

c-UL-us / c-ETL-us - listed for Damp location.
c-UL-us / c-ETL-us - listed for feed Through Wiring.
LM79 / LM80

DIMMING INFORMATION

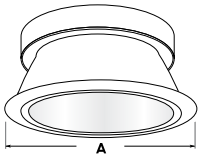
DIM10 (0-10V Dimming)
LUTH (Lutron® Hi-lume® Dimming)
DIMTR (Triac & Electronic Low Voltage Dimming)

Custom color available, please consult factory.
Must provide RAL#

Example: **SCH8-LED-CM-WH-900L-DIM10-120-MD-30K-90-HH8-8501-CL-WH**

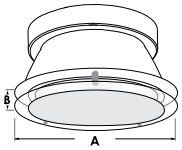
SCH8-LED - WM		- 3000L-DIM10			- 120	- WD		- 85		- HH8-8501		- CL-WH	
TYPE	FINISH	LUMENS/DRIVER			VOLTAGE	OPTICS	CCT	CRI	EMERGENCY	TRIM TYPE		REFLECTOR/ RING FINISH	DISC
		900L SERIES	1200L SERIES	1500L SERIES						NO DISC	WITH DISC		
SCH8-LED	❑ WH-WHITE	❑ 900L-DIM10	❑ 1200L-DIM10	❑ 1500L-DIM10	❑ 120	❑ WD (Wide)	❑ 27K	❑ 85+	☐ EMG-LED	❑ HH8-8501	❑ HH8-8509	❑ CL-WH	❑ BLUE
MOUNTING	❑ BK-BLACK	❑ 900L-DIMTR [1]	❑ 1200L-DIMTR [1]	❑ 1500L-DIMTR [1]	❑ 277	❑ MD (Medium)	❑ 30K	❑ 90+	Typical lumen output of the fixture is up to 1000L in emergency mode. Contact the factory for details.	❑ HH8-8507	❑ HH8-8510	❑ CL-SCH	❑ RED
❑ CM-CEILING MOUNT	❑ Bz- BRONZE	❑ 900L-LUTH [2]	❑ 1200L-LUTH [2]	❑ 1500L-LUTH [2]	❑ 347 (DIM10 only)	❑ ND (Narrow)	❑ 35K	❑ 98+ [4]		❑ HH8-8521	❑ HH8-8511	❑ SHZ-SHZ	❑ GREEN
❑ WM-WALL MOUNT	❑ SI-SILVER	❑ 900L-LUT2W [1]	❑ 1200L-LUT2W [1]	❑ 1500L-LUT2W [1]			❑ 40K			❑ HH8-8522	❑ HH8-8528	❑ SHZ-WH	❑ FROST
❑ UWM-UP/DOWN WALL MOUNT ONLY		❑ 900L-ELDO10-.1 [2]	❑ 1200L-ELDO10-.1 [2]	❑ 1500L-ELDO10-.1 [2]			❑ 50K [3] (85+CRI only)			❑ HH8-8523		❑ W-WH	❑ AL
❑ PM12-12”		❑ 900L-ELDODALI -.1 [2]	❑ 1200L-ELDODALI -.1 [2]	❑ 1500L-ELDODALI -.1 [2]						❑ HH8-8525		❑ MB-WH	❑ BZ
❑ PM18-18”		❑ 900L-ELDODMX -.1 [2]	❑ 1200L-ELDODMX -.1 [2]	❑ 1500L-ELDODMX -.1 [2]						❑ HH8-8577		❑ WT-WH	❑ WH
❑ PM24-24”		2000L SERIES	3000L SERIES	4000L SERIES									
❑ PM36-36”		❑ 2000L-DIM10	❑ 3000L-DIM10	❑ 4000L-DIM10									
❑ PM48-48”		❑ 2000L-DIMTR [1]	❑ 3000L-LUTH [2]	❑ 4000L-LUTH [2]									
❑ SM-10’ SUSPENDED MOUNT (Consult factory for other sizes)		❑ 2000L-LUTH [2]	❑ 3000L-LUT2W [1]	❑ 4000L-LUT2W [1]									
		❑ 2000L-LUT2W [1]	❑ 3000L-ELDO10-.1 [2]	❑ 4000L-ELDO10-.1 [2]									
		❑ 2000L-ELDO10-.1 [2]	❑ 3000L-ELDODALI -.1 [2]	❑ 4000L-ELDODALI -.1 [2]									
		❑ 2000L-ELDODALI -.1 [2]	❑ 3000L-ELDODMX -.1 [2]	❑ 4000L-ELDODMX -.1 [2]									
		❑ 2000L-ELDODMX -.1 [2]											

[1] **LUT2W** and **DIMTR** are available in 120V only [2] **LUTH, ELD010-.1, ELDODALI -.1, and ELDODMX-.1** are available in 120V and 277V [3] **50K** series are available with 85+ CRI only [4] **98+** CRI is available in 27K, 30K and 40K only



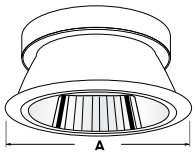
A= 9-1/4"

EXAMPLE: HH8-8501-CL-WH
HH8-8501 - REFLECTOR WITH DIFFUSE LENS
REFLECTOR/RING FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH



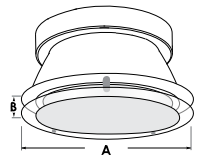
A= 9-1/4"
B= 1"

EXAMPLE: HH8-8509-CL-WH
HH8-8509 - DECO GLASS REFLECTOR WITH DIFFUSE LENS
REFLECTOR/RING FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH
GLASS FINISH:
BLUE, RED, GREEN, FROST



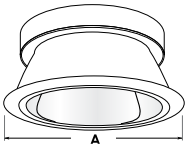
A= 9-1/4"

EXAMPLE: HH8-8507-CL-WH
HH8-8507 - WALL WASH REFLECTOR WITH DIFFUSE LENS
REFLECTOR/RING FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH



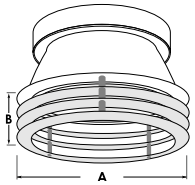
A= 9-1/4"
B= 1"

EXAMPLE: HH8-8525-CL-WH
HH8-8525 - CENTRAL ETCHED FLOAT GLASS WITH DIFFUSE LENS
REFLECTOR/RING FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH



A= 9-1/4"

EXAMPLE: HH8-8577-CL-WH
HH8-8577 - DOUBLE WALL WASH REFLECTOR WITH DIFFUSE LENS
REFLECTOR/RING FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH



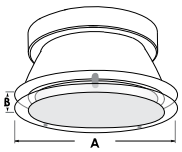
A= 9-1/4"
B= 2-3/4"

EXAMPLE: HH8-8511-CL-WH
HH8-8511 - TRIPLE RING GLASS WITH DIFFUSE LENS
REFLECTOR/RING FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH
GLASS FINISH:
BLUE, RED, GREEN, FROST

EXAMPLE: HH8-8528-CL-WH-AL
HH8-8528 - REFLECTOR WITH ALUMINIUM DISC AND DIFFUSE LENS
REFLECTOR FINISH:
CL-WH CL-SCH WT-WH SHZ-WH W-WH SHZ-SHZ MB-WH
DISC FINISH:
AL, WH, BZ

HH8-8528-CL-W-WH

HH8-8528-CL-WH-BZ

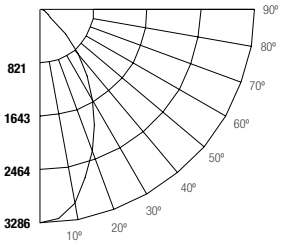


A= 9-1/4"
B= 1"

SCH8-LED-CM-WH-3000L-DIM10-120-WD-40K-HH8-8501-SHZ-SHZ TEST NO.: **EL-101367**

INPUT WATTS: **46** LUMENS: **3025** CRI: **85+** EFFICACY: **65.7** CCT: **4000K** SPACING CRITERIA: **0.88**

Candle Power Distribution (Candelas)



Cone of Light		
4.0	205.4	4.2'
8.0	51.3	8.5'
12.0	22.8	12.7'
16.0	12.8	17.0'
20.0	8.2	21.2'
Distance to Plane	Initial Footcandle at Nadir	Beam diameter

BEAM DIA. MEASURED AT 50% OF NADIR F.C.

Zonal Lumens Summary

Zone	Lumens	%Lamp	%Fixt
0-20	1011.97	33.70	33.50
0-30	1849.76	61.60	61.20
0-40	2553.15	85.00	84.40
0-60	2991.76	99.60	98.90
0-80	3021.47	100.60	99.90
0-90	3024.83	100.70	100.00

Luminance (Average candela/M^2)

Angle in Degrees	Average 0°	Average 45°	Average 90°
45	24409	24342	14865
55	8248	6564	2499
65	4297	1336	821
75	1194	794	406
85	2402	1746	231

Lumens Per Zone

Zone	Lumens
0-10	295.05
10-20	716.92
20-30	837.79
30-40	703.40
40-50	352.64
50-60	85.97
60-70	23.34
70-80	6.36
80-90	3.36

Candela Tabulation

	0
0	3285
5	3228
15	2677
25	1965
35	1253
45	549
55	150
65	57
75	9
85	6
90	5

Coefficients of Utilization - Zonal Cavity Method
Effective Floor Cavity Reflectance 0.20

	RC	80%				70%				50%			30%			10%			0%
	RW	70%	50%	30%	10%	70%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0%
ROOM CAVITY RATIO	0	120	120	120	120	117	117	117	117	112	112	112	107	107	107	103	103	103	101
	1	114	111	108	106	111	109	106	104	105	103	101	101	99	98	97	96	95	93
	2	108	102	98	94	105	101	97	93	97	94	91	94	92	89	92	89	87	86
	3	102	95	89	85	100	93	88	84	91	86	83	88	85	82	86	83	80	79
	4	96	88	82	77	94	87	81	77	84	80	76	82	78	75	80	77	74	73
	5	91	82	75	71	89	81	75	70	79	74	70	77	73	69	76	72	68	67
	6	86	76	70	65	84	75	69	65	74	68	64	72	68	64	71	67	63	62
	7	81	71	65	60	80	70	64	60	69	64	60	68	63	59	67	62	59	57
	8	77	67	60	56	76	66	60	56	65	59	55	64	59	55	63	58	55	53
	9	73	63	56	52	72	62	56	52	61	56	52	60	55	51	59	55	51	50
	10	69	59	53	49	68	58	53	49	58	52	48	57	52	48	56	51	48	47

***RC** - Ceiling Cavity Reflectance* ***RW** - Wall Reflectance*

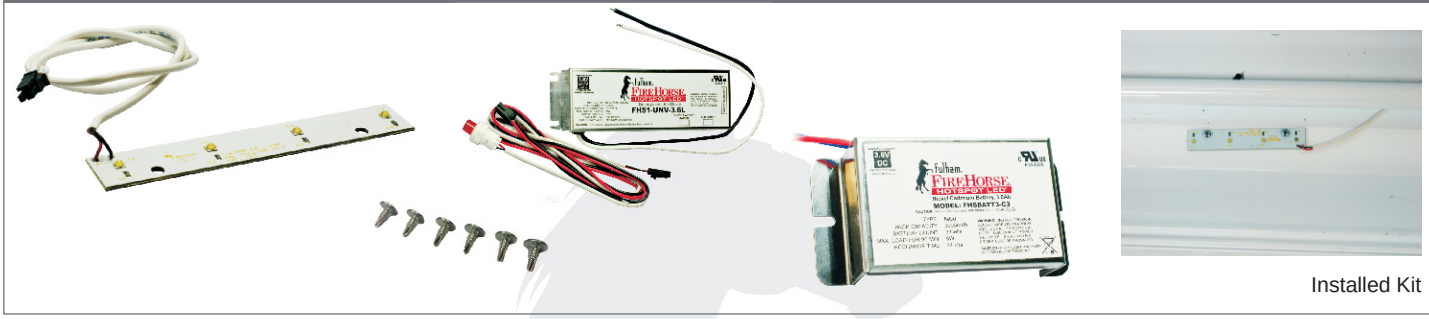
Due to the changes of constant improvement in LED technology, all details are subject to change without notice.
Consult factory for up to date information.

Specification Sheet : FHSKITT04LNC

Project:_____Type:_____Model No.:_____

Remarks:_____

HotSpot UL Classified Kits



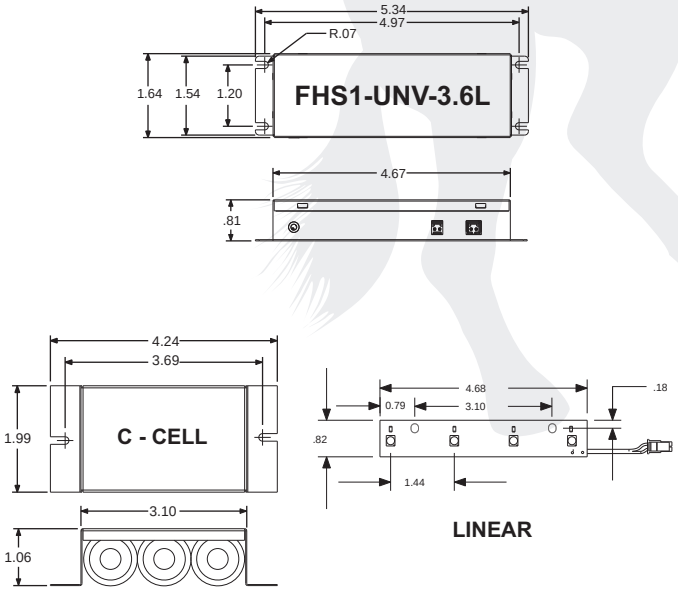
Installed Kit

Specification:

CLASSIFIED c UL us E365124

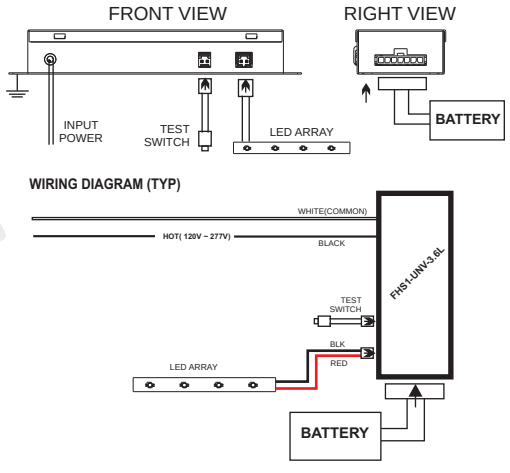
INPUT VOLTAGE	120V - 277V ± 10%, 47-63Hz
SURGE PROTECTION	C62.41 (TVS)
OVER CURRENT PROTECTION	FUSE
INPUT CURRENT	0.07A
INPUT POWER	<4W
LUMEN OUTPUT	500 LUMENS
MAXIMUM OUTPUT CURRENT	2.1 AMP WHEN USED WITH # FHSBATT3-C3
OUTPUT VOLTAGE	3.6V
OUTPUT SHORT CIRCUIT PROTECTION	SELF RESETTING PTC
RECHARGE TIME REQUIRED	24 HRS
BATTERY TYPE	NiCd 3.6VDC
BATTERY CAPACITY AVAILABLE	3Ah
ILLUMUNATION TIME	MINIMUM 90 MIN
ESTIMATED RUN TIME	145 MIN
OUTPUT CLASSIFICATION	UL 1310 / CLASS 2
AMBIENT TEMPERATURE	0ºC - 50ºC

Mechanical Data:



Wiring Diagram

WIRE	BLACK	WHITE	BATTERY- LED ARRAY- TEST SWITCH- PILOT LIGHT
LENGTH - INCHES	12 ± 1"	12 ± 1"	24 ± 1"



Fulham extends a limited warranty only to the original purchaser or to the first user for a period of 5 years from the date of manufacture when properly installed and operated under normal conditions of use. For complete terms and conditions, please reference the Fulham product catalog (www.fulham.com)
Due to a program of continuous improvement, Fulham reserves the right to make modifications or variations in design or construction to the equipment described.

INSTALLATION INSTRUCTIONS

1.5X4

2X2

2X4

FHSKIT-TXXLNXX or FHSKIT-TXXXHXX

HotSpot1 LED Emergency Kit

Troffer Luminaires

TABLE OF CONTENTS

1.0 INSTALLATION INSTRUCTION WARNINGS ..... PAGE 2

2.0 ORIGINAL FIXTURE PARTS ..... PAGE 3

3.0 HOTSPOT LED KIT PARTS ..... PAGE 4

4.0 HOTSPOT LED KIT INSTALLATION ..... PAGES 5-6

5.0 HOTSPOT LED KIT SETUP ..... PAGES 7-12

6.0 WARRANTY ..... PAGE 13

1.0 INSTALLATION INSTRUCTION WARNINGS

IMPORTANT SAFEGUARDS READ AND FOLLOW ALL SAFETY INSTRUCTIONS.

1. “THIS PRODUCT MUST BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE INSTALLATION CODE BY A PERSON FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THE PRODUCT AND THE HAZARDS INVOLVED.”
2. "WARNING - Risk of fire or electric shock. LED Retrofit kit installation requires knowledge of luminaires electrical systems. If not qualified, do not attempt installation. Contact a qualified electrician.”
3. "WARNING - Risk of fire or electric shock. Install this kit only in the luminaries that has the construction features and dimensions shown in the photographs and/or drawings."
4. "WARNING - To prevent wiring damage or abrasion, do not expose wiring to edges of sheet metal or other sharp objects."
5. “WARNING – Risk of fire or electric shock. Luminaire wiring and electrical parts may be damaged when drilling for installation of LED retrofit kit. Check for enclosed wiring and components.”
6. “WARNING - Do not mount near gas or electric heaters.”
7. “WARNING - Equipment should be mounted in locations and at heights where it will not be subjected to tampering by unauthorized personnel.”
8. “WARNING - The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition.”
9. “WARNING - Do not use this equipment for other than its intended use.”
10. “WARNING - Maximum luminaire mounting height: 10 Feet”

SAVE THESE INSTRUCTIONS.

2.0 ORIGINAL FIXTURE

Intended for the following luminaires:

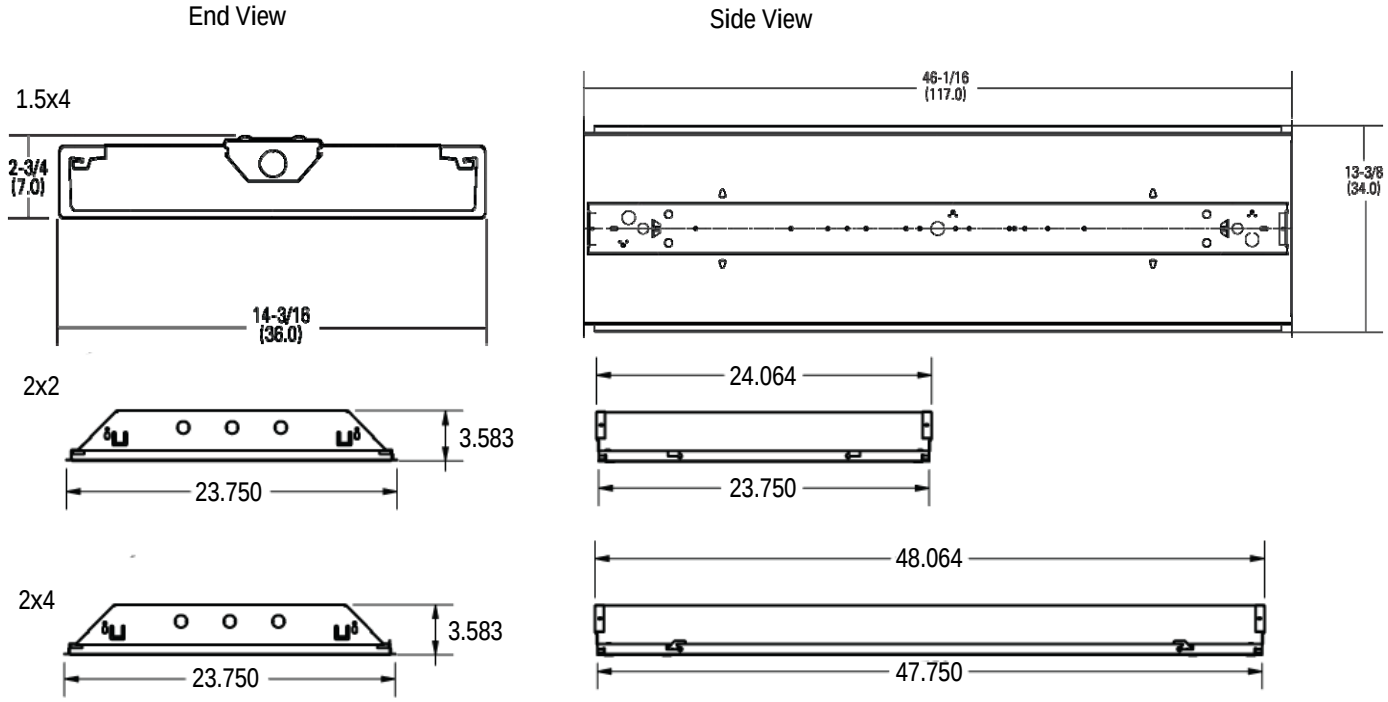


Illustration 1: Luminaire Dimensions

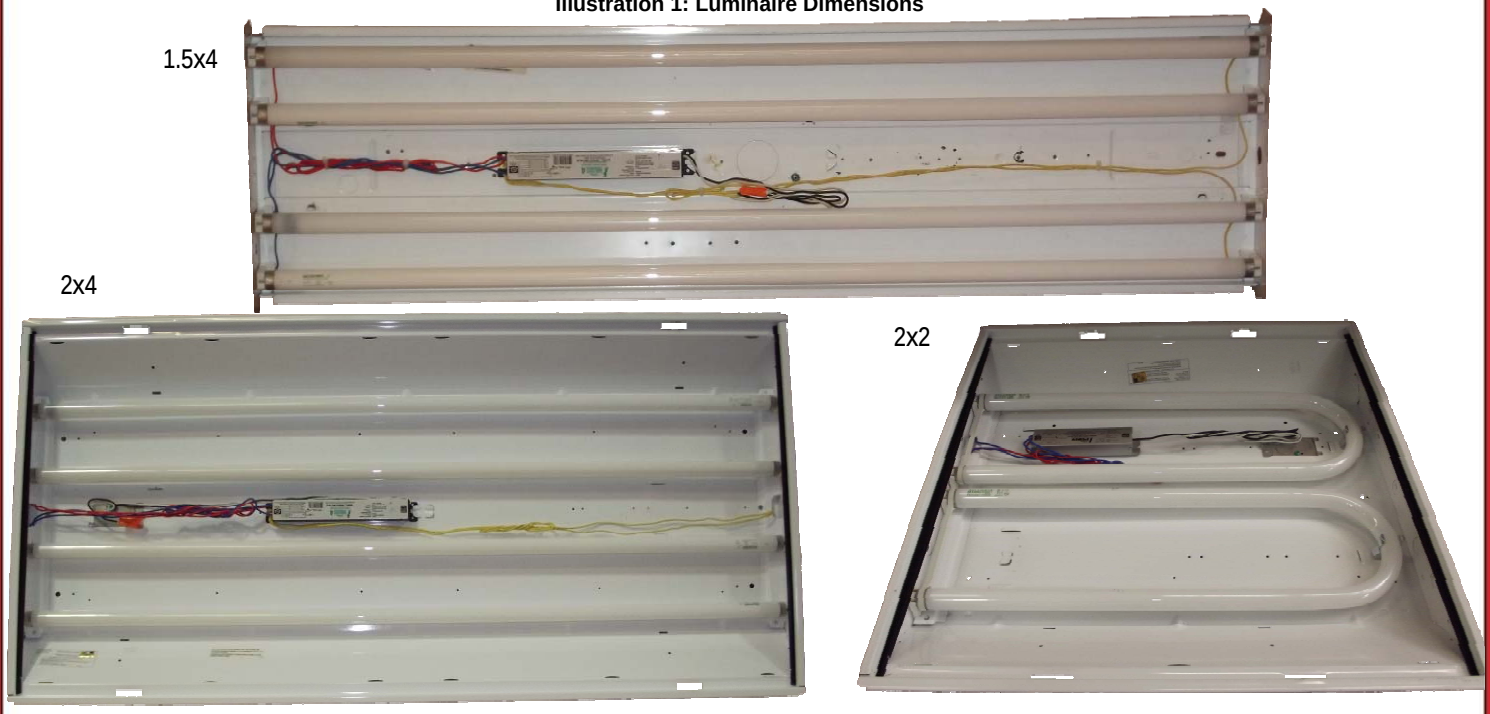


Figure 1: Original Luminaire

NOTE: NOT Suitable for installation in sealed or gasketed compartments

Original Luminaire Disassembly:

- Remove lamps (if installed) and wire-way cover from the luminaire.

3.0 HOTSPOT LED KIT PARTS

A) Hotspot LED Driver

FHS1-UNV-3.6L

B) LED Battery

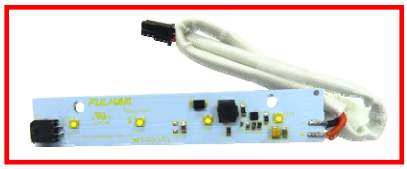
FHSBATT3-D4

FHSBATT3-C3

FHSBATT3-F7L

C) LED Module

Linear Module
(FHS1-AR-4W-L)



Linear Module w/ multiple connections
(FHS6-AR-3W-L)

"H" Configuration Module
(FHS3-AR-6W-SH), (FHS4-AR-8W-LH)
(FHS3-AR-10W-SH), (FHS4-AR-10W-LH)

D) Hardware: Screw quantities may change depending on setup

Figure 2: Hotspot LED Kit Parts

FHSKIT-TXXXXXX LED Kit Parts:

2x4 Troffer

A) LED Driver: FHS1-UNV-3.6L
- Battery: FHSBATT3-C3
- LED Arrays: FHS1-AR-4W-L or FHS3-AR-6W-SH

B) LED Driver: FHS1-UNV-3.6L
- Battery: FHSBATT3-F7L
- LED Arrays: FHS1-AR-4W-L, FHS3-AR-6W-SH, FHS4-AR-8W-LH, FHS3-AR-10W-SH, FHS4-AR-10W-LH, FHS6-AR-3W-L x1, FHS6-AR-3W-L x2, or FHS6-AR-3W-L x3

2x2 Troffer

A) LED Driver: FHS1-UNV-3.6L
- Battery: FHSBATT3-C3
- LED Arrays: FHS1-AR-4W-L or FHS3-AR-6W-SH

1.5x4 Troffer

A) LED Driver : FHS1-UNV-3.6L
- Battery: FHSBATT3-C3
- LED Arrays: FHS1-AR-4W-L

B) LED Driver FHS1-UNV-3.6L
- Battery: FHSBATT3-D4
- LED Arrays: FHS1-AR-4W-L, FHS6-SR-3W-L x1, or FHS6-SR-3W-L x2

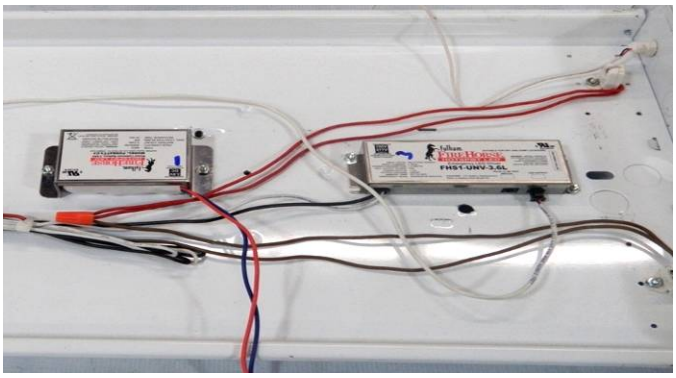
C) LED Driver: FHS1-UNV-3.6L
- Battery: FHSBATT3-F7L
- LED Arrays: FHS1-AR-4W-L, FHS6-AR-3W-L x1, FHS6-AR-3W-L x2, or FHS6-AR-3W-L x3

Hardware:
- #6-20x3/8" Phillips Pan Head Self Drilling Screws
- Quantity: 6-10 (Depending on setup)

4.0 HOTSPOT LED KIT INSTALLATION

1. Remove the wire way cover and place the Emergency LED Driver and LED battery pack onto the luminaire's wire-way area. See picture #1.
2. Place the selected LED Module onto the luminaire, in the space between the original lamps. See picture #2.
3. Secure all LED components to the luminaire by using the provided screws.
4. On the already removed wire way cover, drill one 1/2" hole into the luminaire's wire-way cover for the Test Switch. See picture #3. Exact location of the drilled hole can be found on page 12 (LED indicator/test switch must be visable after installation).
5. Insert the Test Switch into the pre-drilled hole in the luminaire's wire-way cover and secure it in place. See picture #3.
6. Connect all LED components based on Illustration #2. For examples of completed installation with wire way please see page 12.

Note:
If additional wire is needed to complete installation; only wire with a minimum rating of 300V should be used.



Picture #1

Picture #2

Picture #3

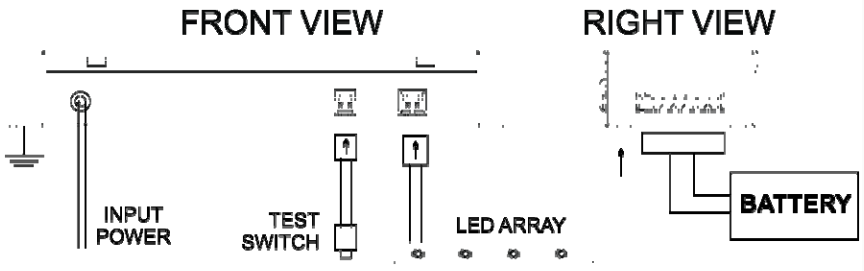
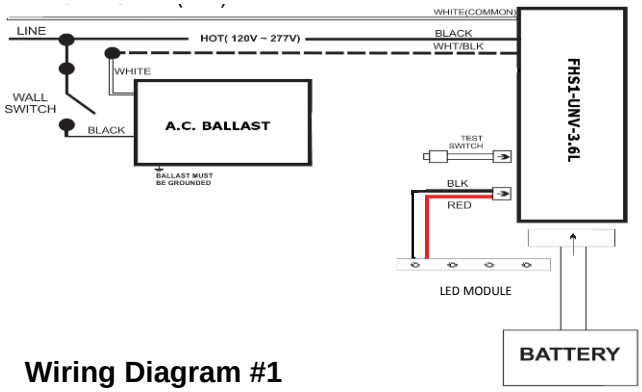


Illustration #2

4.1 HOTSPOT LED KIT INSTALLATION

7. Wire all LED components based on the Wiring Diagram #1.
8. Test the setup by connecting the LED Battery Pack connector to Emergency LED Driver side Terminal. See picture #4.
9. Re-attach the wire-way cover and the original lamps. See picture #5.
10. Depending on the LED setup and preference, completed installation should look like the following (see pages 7-11).

Note:
If additional wire is needed to complete installation; only wire with a minimum rating of 300V should be used.



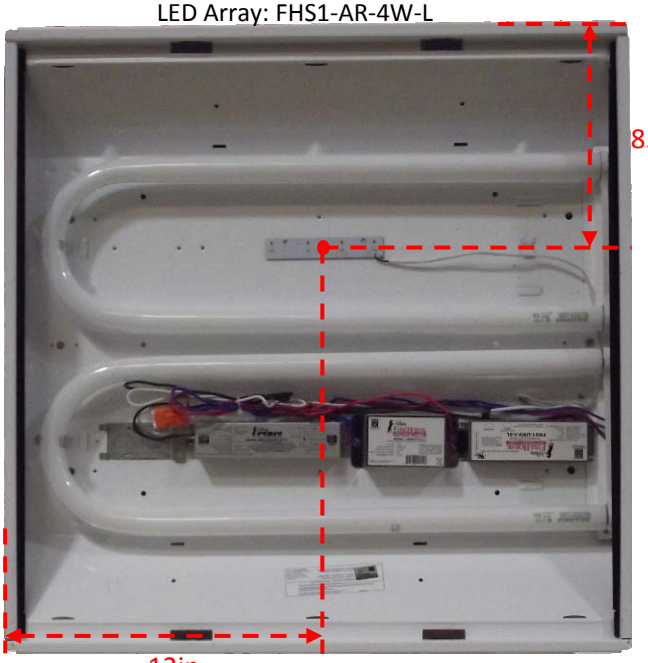
Wiring Diagram #1

Picture #4

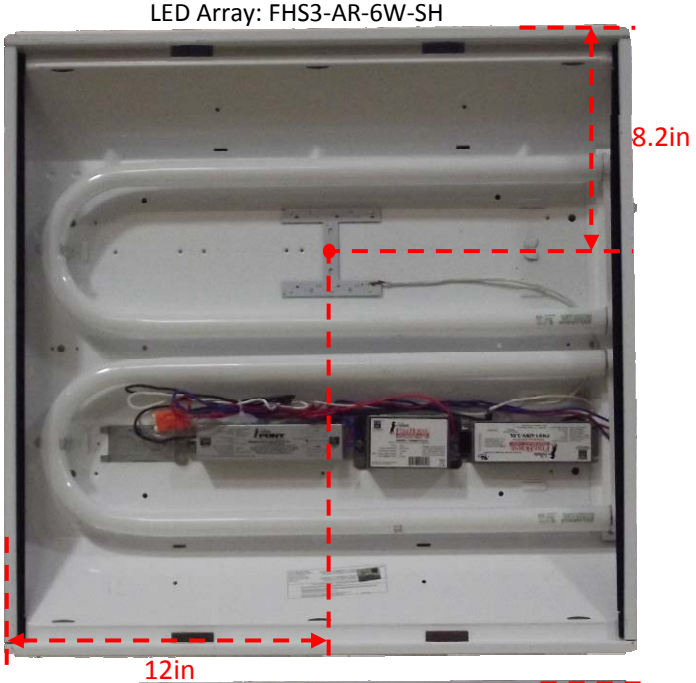
Picture #5

5.0 HOTSPOT LED KIT SETUP

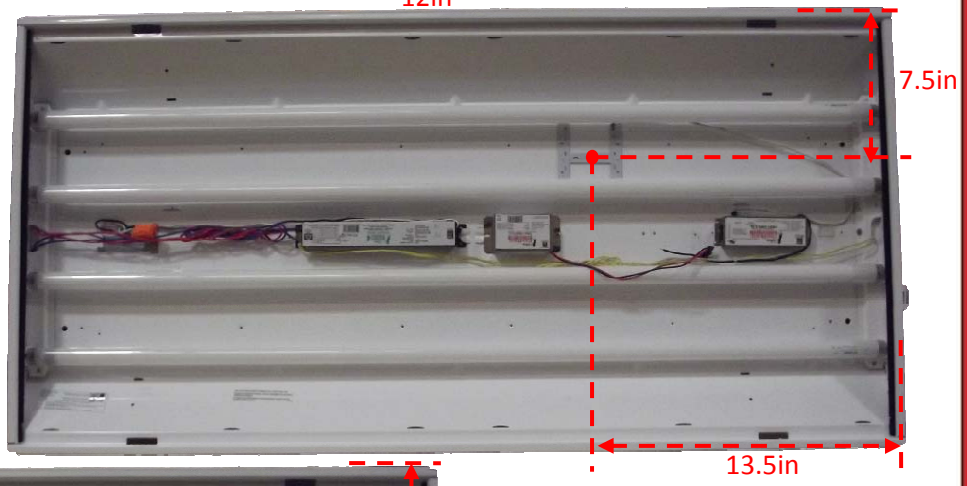
2X2 Troffer
Battery: FHSBATT3-C3
LED Array: FHS1-AR-4W-L

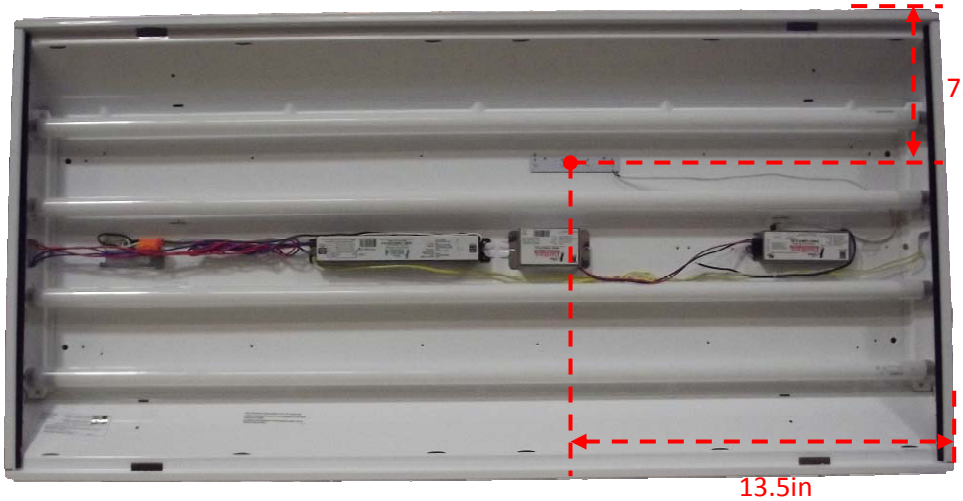


2X2 Troffer
Battery: FHSBATT3-C3
LED Array: FHS3-AR-6W-SH



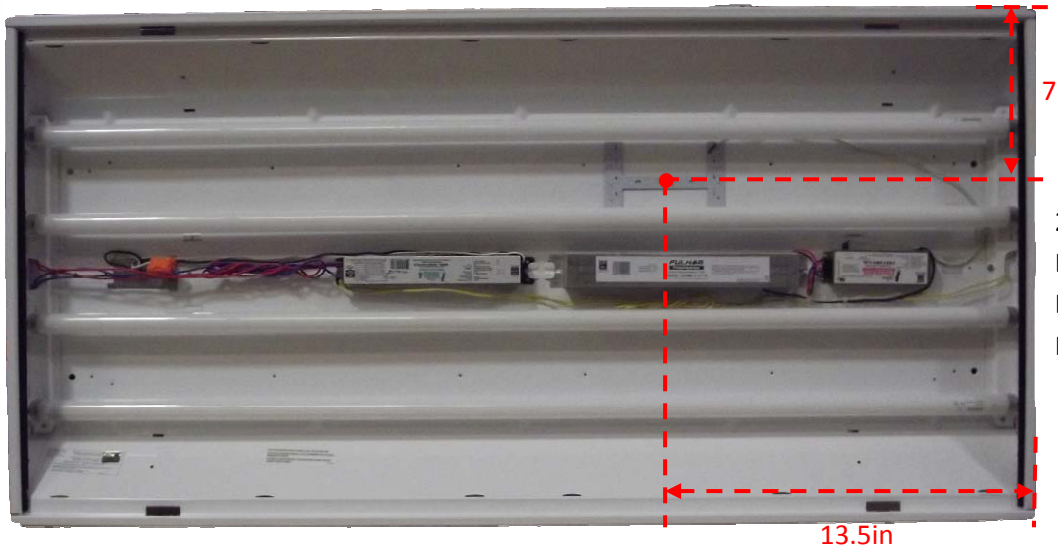
2X4 Troffer
Battery: FHSBATT3-C3
LED Array: FHS3-AR-6W-SH



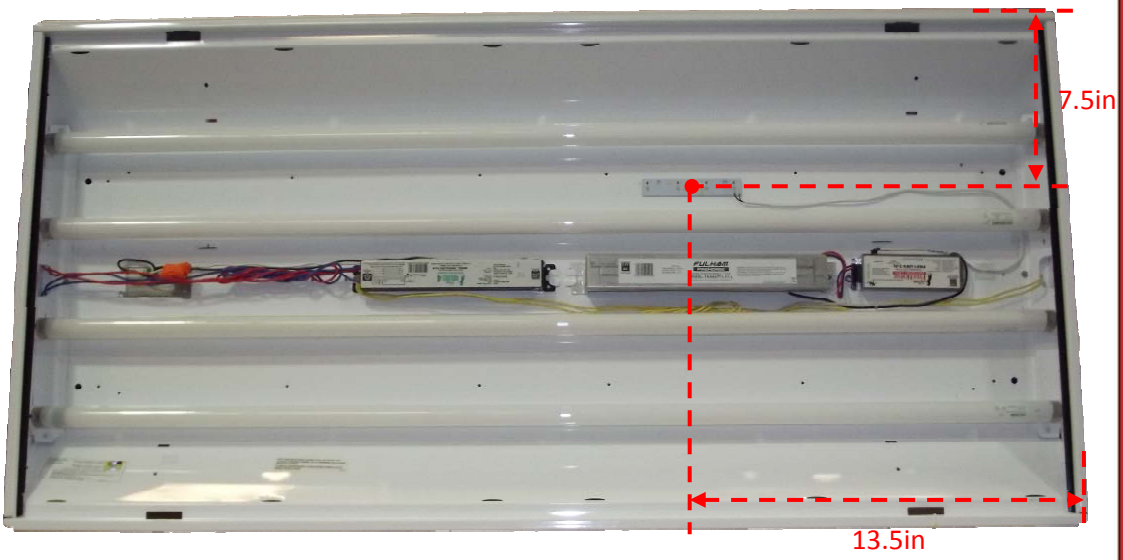


2X4 Troffer
Battery: FHSBATT3-C3
LED Array: FHS1-AR-4W-L

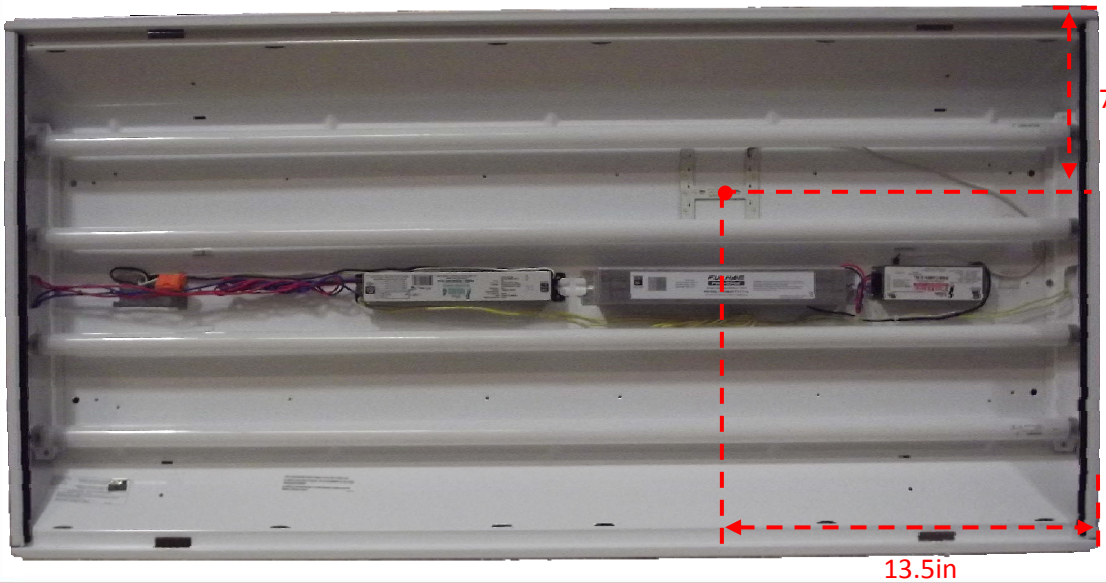
5.1 HOTSPOT LED KIT SETUP



2X4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS4-AR-8W-LH,
FHS4-AR-10W-LH

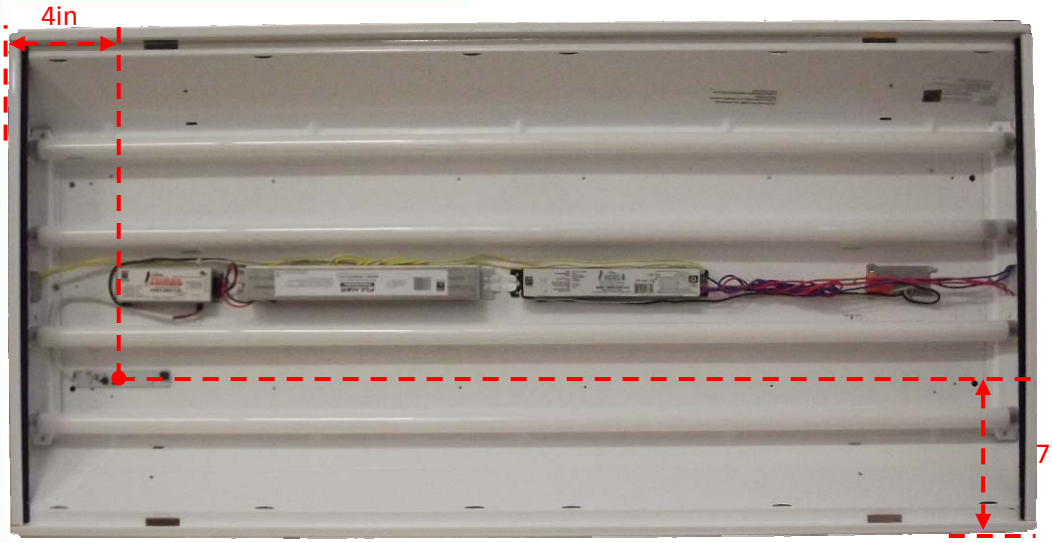


2X4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS1-AR-4W-L

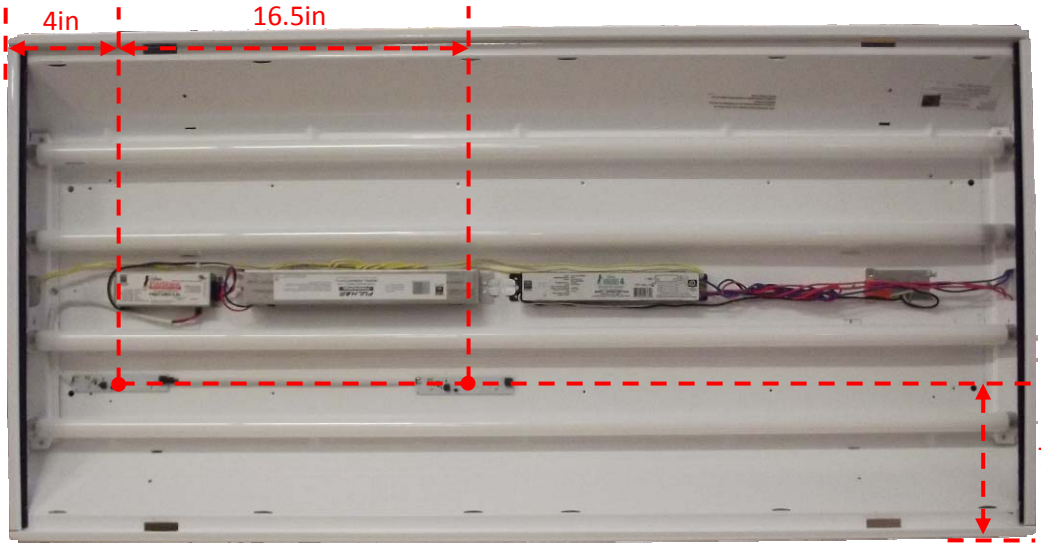


2X4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS3-AR-6W-SH,
FHS4-AR-10W-SH

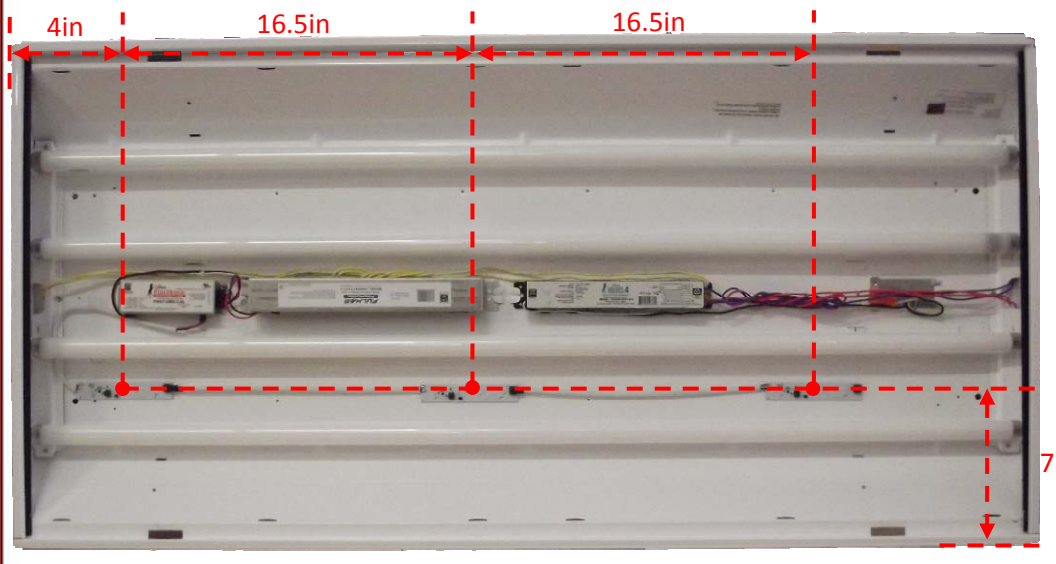
5.2 HOTSPOT LED KIT SETUP



2X4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS6-AR-3W-L x1

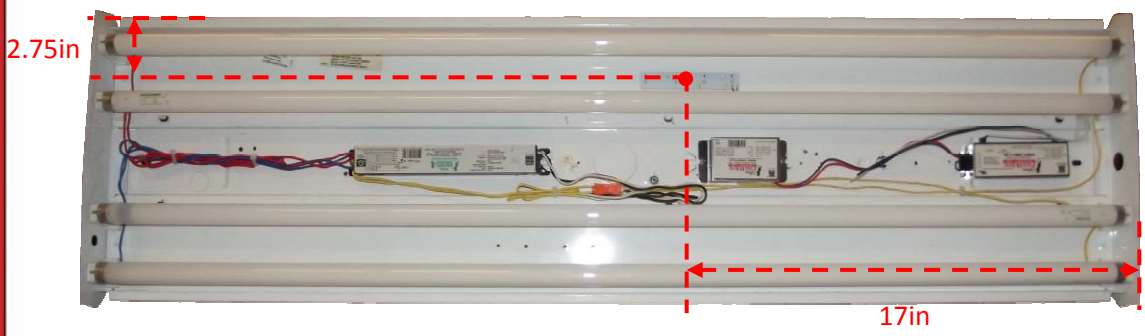


2X4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS6-AR-3W-L x2

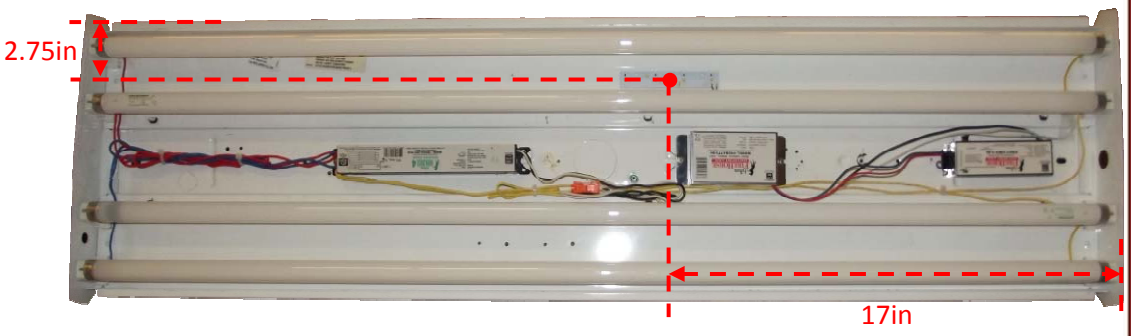


2X4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS6-AR-3W-L x3

5.3 HOTSPOT LED KIT SETUP

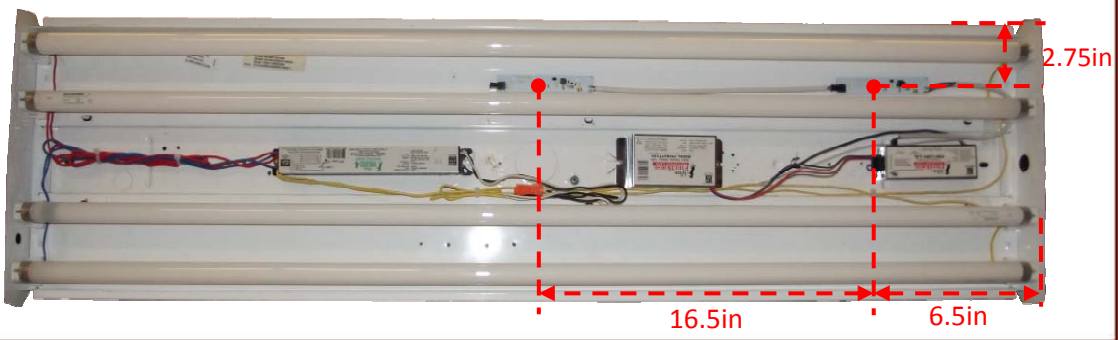


1.5x4 Troffer
Battery: FHSBATT3-C3
LED Arrays: FHS1-AR-4W-L



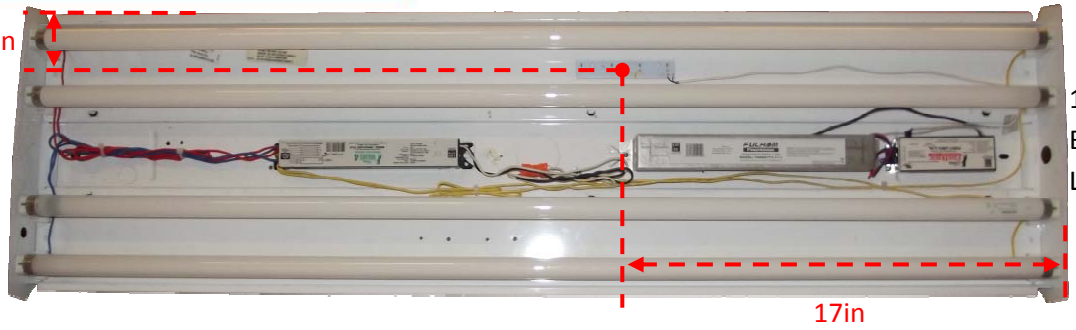
1.5x4 Troffer
Battery: FHSBATT3-D4
LED Arrays: FHS1-AR-4W-L

1.5x4 Troffer
Battery: FHSBATT3-D4
LED Arrays: FHS6-AR-3W-L x1



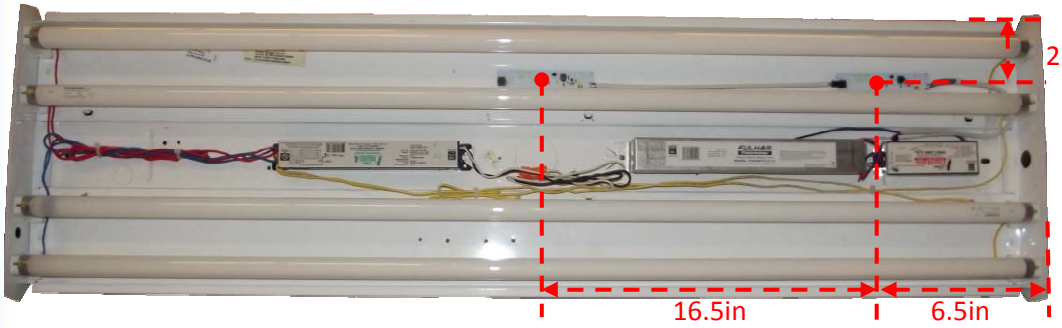
1.5x4 Troffer
Battery: FHSBATT3-D4
LED Arrays: FHS6-AR-3W-L x2

5.4 HOTSPOT LED KIT SETUP



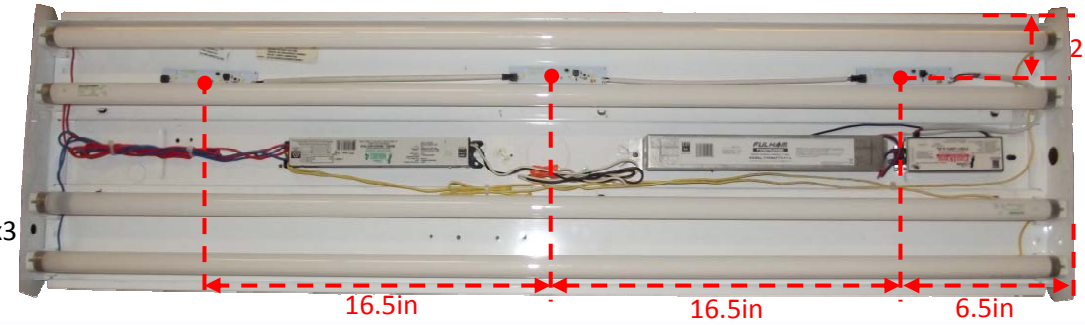
1.5x4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS1-AR-4W-L

1.5x4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS6-AR-3W-L x1



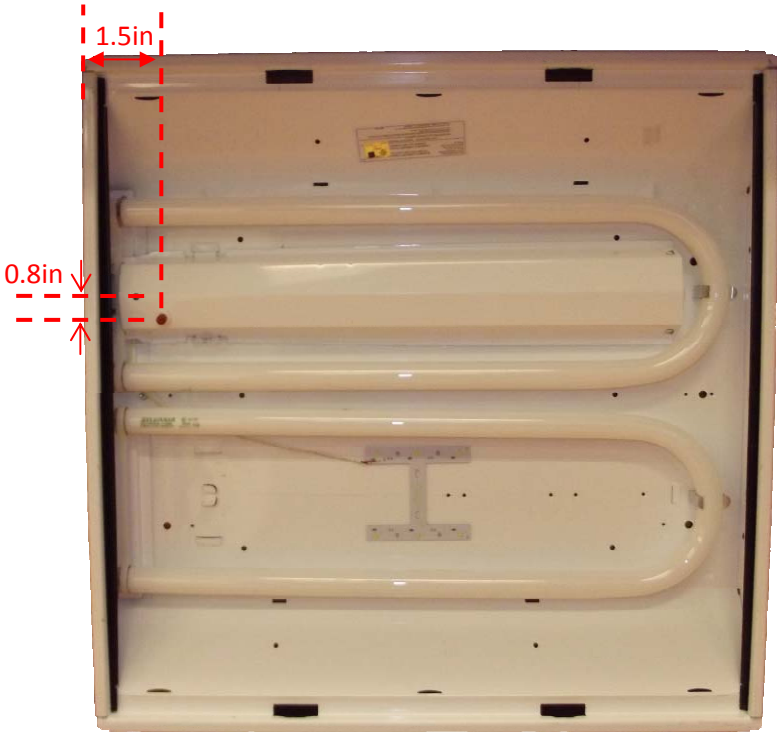
1.5x4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS6-AR-3W-L x2

1.5x4 Troffer
Battery: FHSBATT3-F7L
LED Arrays: FHS6-AR-3W-L x3

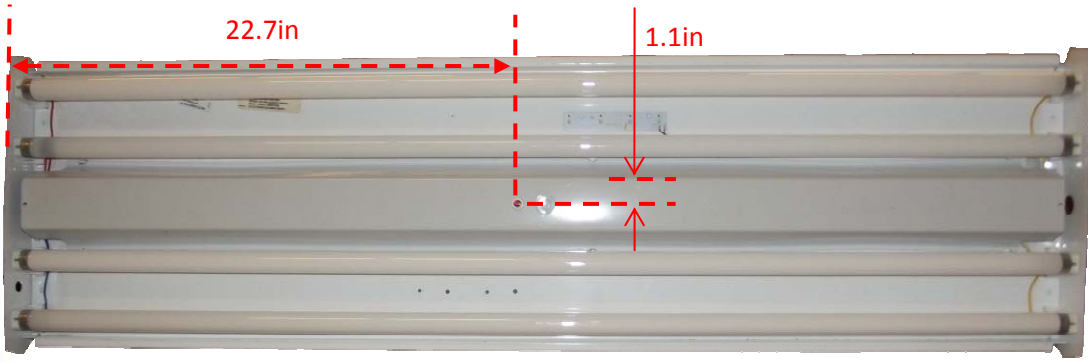


5.5 HOTSPOT LED KIT SETUP

Example of 2X4 Troffer with completed installation and wire way reattached



Example of 2X2 Troffer with completed installation and wire way reattached



Example of 1.5X4 Troffer with completed installation and wire way reattached

6.0 WARRANTY

Warranty

Please see our warranty policy on Fulham's LED Emergency Lighting Program.

Component Part Numbers

To order Hotspot LED Modules, Drivers, Battery Packs, and/or Hotspot LED kits, please contact us and use the part numbers below to order:
Hotspot LED Module: FHS1-AR-4W-L, FHS3-AR-6W-SH, FHS3-AR-10W-SH, FHS4-AR-8W-LH, FHS4-AR-10W-LH, or FHS6-AR-3W-L
Hotspot LED Driver: FHS1-UNV-3.6L
Hotspot LED Battery Pack: FHSBATT3-C3, FHSBATT3-D4, or FHSBATT3-F7L
Hotspot LED Retrofit Kit Part Number: FHSKIT-TXXLNXX or FHSKIT-TXXXHXX

PAR38 17W DIM. TITANIUM CR

Paterson BOE PS9
Tri State LED
#17PAR38G4DIM/940FL40

GREENCREATIVE

ENERGY STAR

HIGH CRI
LED TECHNOLOGY

REFINE SERIES

CRI^{SP}

17W REPLACES

120W Hal.

80% Energy Savings

$331 Savings per lamp*

- Full-face REFINE optic and sleek design
- Exceptional color rendering CRI 90
- Richer reds and natural skin tones (R9 50, R13 90)
- Tight LED binning for consistent CCT across all lamps
- Suitable for use in totally enclosed fixtures
- Wet location rated for outdoor use

40,000 H

DIMMABLE

WET LOCATION

5 YR WARRANTY

90 CRI (Ra)

ENCLOSED**

c UL us LISTED

FC

lighting facts LED Product Partner

LM 79 LM 80 TM 21 IES

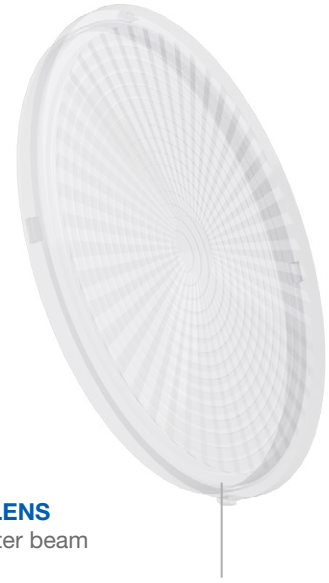
PATENT PENDING REFINE OPTIC

The innovative REFINE optic provides a high candela to lumen ratio, optimizing light usage for directional applications.

REFINE SERIES

REFLECTOR
Directs light

FOCUS LENS
Focuses center beam



SHAPING LENS
Refines beam pattern

WATCH THE VIDEO

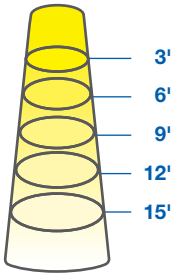
PAR38 17W DIM. TITANIUM CRI^{SP} LED SERIES 4.0

GREENCREATIVE

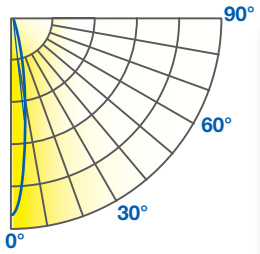
Ref.#: DS061-PAR38-17W

ILLUMINANCE & CANDELA DISTRIBUTION

18.5PAR38G4DIM/930SP15

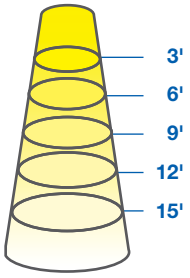


Diameter	Footcandles
0.8	1222
1.6	306
2.4	136
3.2	76
3.9	49

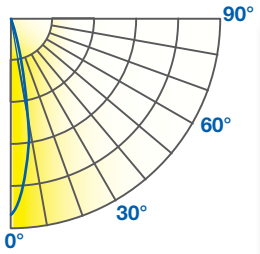


Degree	Candela
0	11,000
5	6028
15	835
25	188
35	111
45	83

18.5PAR38G4DIM/930NF25

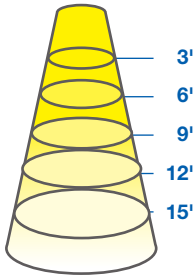


Diameter	Footcandles
1.3	656
2.7	164
4	73
5.3	41
6.7	26

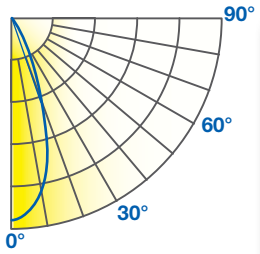


Degree	Candela
0	5900
5	5326
15	156
25	321
35	116
45	92

17PAR38G4DIM/930FL40



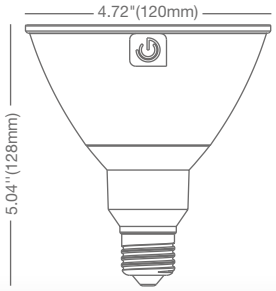
Diameter	Footcandles
2.2	278
4.4	69
6.6	31
8.7	17
10.9	11



Degree	Candela
0	2500
5	2329
15	1489
25	381
35	143
45	74

For other CCT use the following multipliers: 2700K .95, 4000K 1.1

Base: E26
Voltage: 120V
Dimmable: Yes***
PF: 0.9
Lifetime: 40,000 hrs
Weight: 0.75lb / 340g



SPECIFICATIONS

Model	Product	Power (W)	CCT	CRI (typ.)	R9 / R13 (typ.)	Lumens	LPW	Beam Angle	CBCP (cd)
18.5PAR38G4DIM/927SP15	16147	18.5	Warm White 2700K	90	50 / 90	950	51	SP 15°	10,500
18.5PAR38G4DIM/927NF25	16148	18.5	Warm White 2700K	90	50 / 90	1105	60	NF 25°	5800
17PAR38G4DIM/927FL40	16149	17	Warm White 2700K	90	50 / 90	1105	65	FL 40°	2400
18.5PAR38G4DIM/930SP15	16150	18.5	Warm White 3000K	90	50 / 90	1000	54	SP 15°	11,000
18.5PAR38G4DIM/930NF25	16151	18.5	Warm White 3000K	90	50 / 90	1150	62	NF 25°	5900
17PAR38G4DIM/930FL40	16152	17	Warm White 3000K	90	50 / 90	1150	68	FL 40°	2500
17PAR38G4DIM/940FL40	16155	17	Natural White 4000K	90	50 / 90	1200	71	FL 40°	2650
18.5PAR38G4DIM/930SP15/B •	16256	18.5	Warm White 3000K	90	50 / 90	1000	54	SP 15°	11,000
18.5PAR38G4DIM/930NF25/B •	16257	18.5	Warm White 3000K	90	50 / 90	1150	62	NF 25°	5900
17PAR38G4DIM/930FL40/B •	16258	17	Warm White 3000K	90	50 / 90	1150	68	FL 40°	2500

• Black finish

* Savings per lamp based on $0.11 / kw energy cost, 12 hrs / day lamp usage, $8 halogen with 1500-hr lifetime, $32 LED with 40,000-hr lifetime
** Suitable for use in totally enclosed fixtures
*** List of tested dimmer switches available on website
**** Suitable for wet locations

Green Creative - 17PAR38G4DIM/940FL40

Specifications

ENERGY STAR Partner:	Green Creative
Product Finder Bulb Type:	Reflector (Flood/Spot)
Base Type:	E26 (Medium)
Lamp Category:	Directional
Technology:	LED
Warranty (years):	5
Energy Used (watts):	17.0
Efficacy (lumens/watt):	70.6
Wattage Equivalency (watts):	120
Maximum Overall Length (mm):	129.2
Maximum Overall Diameter (mm):	120.3
CBCP:	2728
Beam Angle:	40
Life (hrs):	25000
Brightness (lumens):	1200
Power Factor:	1.0
Light Appearance (Kelvin):	4000
Color Quality (CRI):	94
R9:	70
Connected Lamp:	No
Dimmable:	Dimmable
Dims Down to %:	4
Three Way:	No
Lamp Rated for Enclosed Fixtures:	Yes

Special Features:	Wet Location Rated,Recessed Fixtures
Date Qualified:	12/27/2016
Date Available on Market:	08/01/2016
Markets:	United States, Canada

6'' CDL 21W TITANIUM LED SERIES

Paterson BOE PS2
Tri State LED
#21CDLA6/840/277V

GREENCREATIVE

ENERGY STAR

INNOFIT SERIES

PRO

Patent Pending

- For retrofit or new construction installation
- Universal housing compatibility – IC-Rated
- Adjustable lumen output – 3 defined light levels
- Easy fit installation – Spring-action housing clips
- Universal voltage 120-277V
- Available in 2700K, 3000K, 3500K & 4000K CCT

40,000 H | 120-277V UNIVERSAL | LUMEN OUTPUT ADJUSTABLE | 5 YR WARRANTY | 80 CRI (Ra) | SEMI DIRECTIONAL

c UL us LISTED | c CLASSIFIED UL us | FC | lighting facts LED Product Partner | LM 79 | LM 80 | TM 21 | IES

COMMERCIAL DOWNLIGHT PRODUCT FEATURES

Adjustable Lumen Output

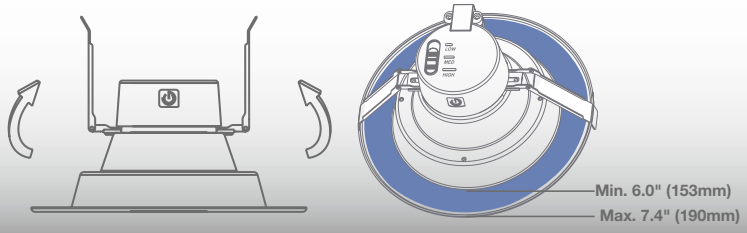
Fluorescent Equivalence Table

Power	Lumens	Equivalent
LOW-8.5W	700	1X18W
MED-13.5W	1000	1X26W / 2X13W
HIGH-21W	1500	1X32W / 2X18W

This commercial downlight features adjustable lumen output for three distinct lumen levels equivalent to various CFL lamp combinations. Simply adjust the lamp power to the desired lumen output by sliding the selector switch on top of the fixture.

Easy-Fit Installation

The adjustable housing clips allow for installation in a large range of commercial and architectural housings ranging from 6.0''-7.4'' (153-190mm). These spring-action clips push up easily and fit securely for both retrofit and new construction installations.



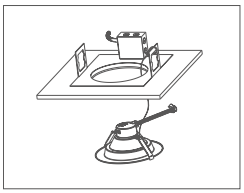
6'' CDL 21W TITANIUM LED SERIES

GREENCREATIVE

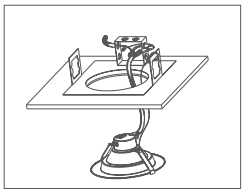
Ref.#:DS123-CDLA-21W-277V-080217

SIMPLE RETROFIT OR ECONOMICAL NEW CONSTRUCTION INSTALLATION

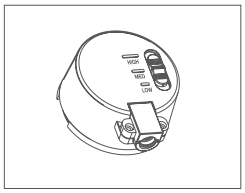
Retrofit Installation



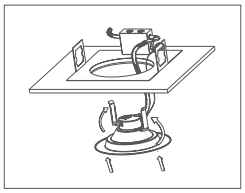
Attach safety clip



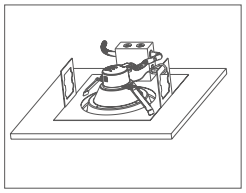
Bypass ballast & wire to j-box



Adjust lumens to desired output

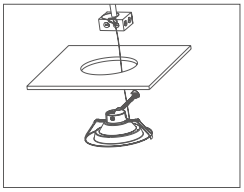


Push clips up & install into fixture

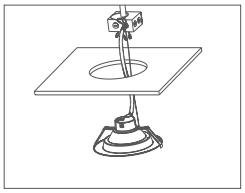


Ensure fixture is flush. Installation is complete

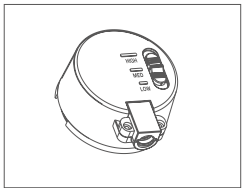
New Construction Installation



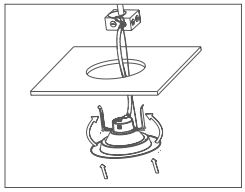
Attach safety clip



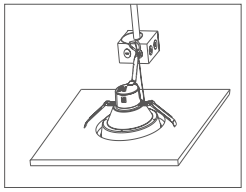
Wire to j-box



Adjust lumens to desired output



Push clips up & install into opening



Ensure fixture is flush. Installation is complete

SPECIFICATIONS

Product Model	57868 21CDLA6/827/277V	57869 21CDLA6/830/277V	57870 21CDLA6/835/277V	57871 21CDLA6/840/277V
Type	6'' Commercial Downlight	6'' Commercial Downlight	6'' Commercial Downlight	6'' Commercial Downlight
Power (W)	8.5 / 13.5 / 21	8.5 / 13.5 / 21	8.5 / 13.5 / 21	8.5 / 13.5 / 21
Voltage - Frequency	120-277V 50-60Hz	120-277V 50-60Hz	120-277V 50-60Hz	120-277V 50-60Hz
Color Temp. (ANSI)	Soft White 2700K	Warm White 3000K	Neutral White 3500K	Cool White 4000K
CRI (Ra) (typ.)	80	80	80	80
Typical lumens (lm)	650 / 930 / 1400	700 / 1000 / 1500	700 / 1000 / 1500	700 / 1000 / 1500
Efficacy (LPW)	76 / 69 / 67	82 / 74 / 71	82 / 74 / 71	82 / 74 / 71
Beam Angle	110°	110°	110°	110°
Dimmable	No	No	No	No
Power Factor	0.9	0.9	0.9	0.9
Rated Lifetime - L70 (hrs.)	40,000	40,000	40,000	40,000
Dia. x MOL	8.27''x4.02'' (210x102mm)	8.27''x4.02'' (210x102mm)	8.27''x4.02'' (210x102mm)	8.27''x4.02'' (210x102mm)
Weight (lb. / g)	1.24lb / 562g	1.24lb / 562g	1.24lb / 562g	1.24lb / 562g

* Suitable for damp locations. Not for use where directly exposed to weather or water
** Full installation guide and more details available on website

Green Creative - LED commercial downlight : 21CDLA6/840/277V

Specifications

ENERGY STAR Partner:	Green Creative
Indoor/Outdoor:	Indoor
Fixture Type:	Downlight Recessed
Technology:	LED
Total Light Output (lumens):	1500
Appearance/Correlated Color Temperature (K):	4000/4100K
Total Input Power (Watts):	21.0
Energy Efficiency - Measured Outside the Fixture (lumens/Watt):	78.6
Power Factor:	0.99
Color Quality (CRI):	83
Light Source Life (hrs):	25000
Can Rating(s):	Type Non-IC
Special Features:	Non-Dimmable
Light Source Connection/Base Type:	N/A
Date Available On Market:	01/01/2016
Date Certified:	02/04/2015
Markets:	United States, Canada

8'' CDL 27W TITANIUM LED SERIES

Paterson BOE PS2
Tri State LED
#27CDLA8/840/277V

GREENCREATIVE

ENERGY STAR

PRO

INNOFIT SERIES

Patent Pending

- For retrofit or new construction installation
- Universal housing compatibility
- Adjustable lumen output – 3 defined light levels
- Easy fit installation – Spring-action housing clips
- Universal voltage 120-277V
- Available in 2700K, 3000K, 3500K & 4000K CCT

40,000 H | 120-277V UNIVERSAL | LUMEN OUTPUT ADJUSTABLE | 5 YR WARRANTY | 80 CRI (Ra) | SEMI DIRECTIONAL

c UL us LISTED | c CLASSIFIED UL us | FC | lighting facts LED Product Partner | LM 79 | LM 80 | TM 21 | IES

COMMERCIAL DOWNLIGHT PRODUCT FEATURES

Adjustable Lumen Output

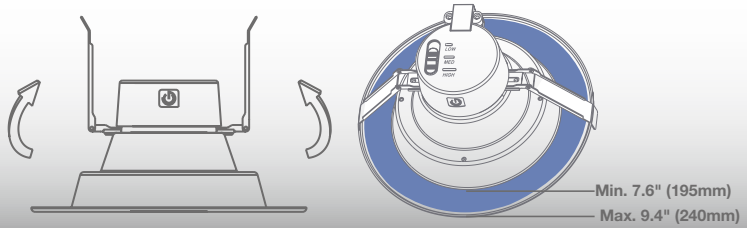
Fluorescent Equivalence Table

Power	Lumens	Equivalent
LOW-12W	1000	1X26W / 2X13W
MED-19W	1500	1X32W / 2X18W
HIGH-27W	2000	1X42W / 2X26W

This commercial downlight features adjustable lumen output for three distinct lumen levels equivalent to various CFL lamp combinations. Simply adjust the lamp power to the desired lumen output by sliding the selector switch on top of the fixture.

Easy-Fit Installation

The adjustable housing clips allow for installation in a large range of commercial and architectural housings ranging from 7.6''- 9.4'' (195-240mm). These spring-action clips push up easily and fit securely for both retrofit and new construction installations.



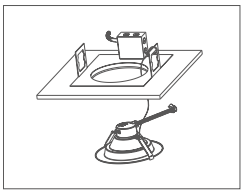
8'' CDL 27W TITANIUM LED SERIES

GREENCREATIVE

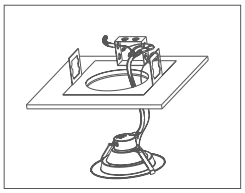
Ref.#:DS124-CDLA-27W-277V

SIMPLE RETROFIT OR ECONOMICAL NEW CONSTRUCTION INSTALLATION

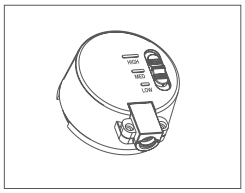
Retrofit Installation



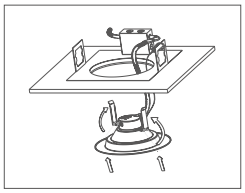
Attach safety clip



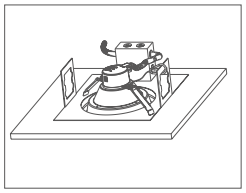
Bypass ballast & wire to j-box



Adjust lumens to desired output

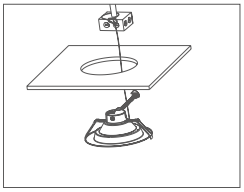


Push clips up & install into fixture

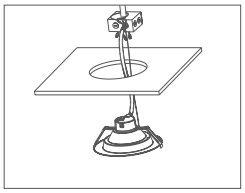


Ensure fixture is flush. Installation is complete

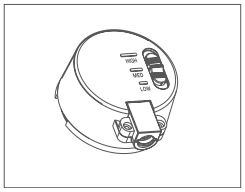
New Construction Installation



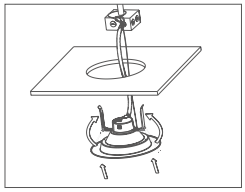
Attach safety clip



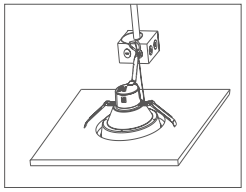
Wire to j-box



Adjust lumens to desired output



Push clips up & install into opening



Ensure fixture is flush. Installation is complete

SPECIFICATIONS

Product Model	57873 27CDLA8/827/277V	57874 27CDLA8/830/277V	57875 27CDLA8/835/277V	57876 27CDLA8/840/277V
Type	8'' Commercial Downlight	8'' Commercial Downlight	8'' Commercial Downlight	8'' Commercial Downlight
Power (W)	12 / 19 / 27	12 / 19 / 27	12 / 19 / 27	12 / 19 / 27
Voltage - Frequency	120-277V 50-60Hz	120-277V 50-60Hz	120-277V 50-60Hz	120-277V 50-60Hz
Color Temp. (ANSI)	Soft White 2700K	Warm White 3000K	Neutral White 3500K	Cool White 4000K
CRI (Ra) (typ.)	80	80	80	80
Typical lumens (lm)	930 / 1400 / 1860	1000 / 1500 / 2000	1000 / 1500 / 2000	1000 / 1500 / 2000
Efficacy (LPW)	78 / 74 / 69	83 / 79 / 74	83 / 79 / 74	83 / 79 / 74
Beam Angle	110°	110°	110°	110°
Dimmable	No	No	No	No
Power Factor	0.9	0.9	0.9	0.9
Rated Lifetime - L70 (hrs.)	40,000	40,000	40,000	40,000
Dia. x MOL	10.24''x3.33'' (260x110mm)	10.24''x3.33'' (260x110mm)	10.24''x3.33'' (260x110mm)	10.24''x3.33'' (260x110mm)
Weight (lb. / g)	1.58 lb. / 717g	1.58 lb. / 717g	1.58 lb. / 717g	1.58 lb. / 717g

* Suitable for damp locations. Not for use where directly exposed to weather or water
** Full installation guide and more details available on website

Green Creative - LED commercial downlight : 27CDLA8/840/277V

Specifications

ENERGY STAR Partner:	Green Creative
Indoor/Outdoor:	Indoor
Fixture Type:	Downlight Recessed
Technology:	LED
Total Light Output (lumens):	2000
Appearance/Correlated Color Temperature (K):	4000/4100K
Total Input Power (Watts):	27.0
Energy Efficiency - Measured Outside the Fixture (lumens/Watt):	83.3
Power Factor:	0.99
Color Quality (CRI):	84
Light Source Life (hrs):	25000
Can Rating(s):	Type Non-IC
Special Features:	Non-Dimmable
Light Source Connection/Base Type:	N/A
Date Available On Market:	01/01/2016
Date Certified:	02/04/2016
Markets:	United States, Canada

9.5'' CDL 45W TITANIUM LED SERIES

Paterson BOE PS9
Tri State LED
#45CDLA9.5/840/277V

GREENCREATIVE

ENERGY STAR

INNOFIT SERIES

PRO

Patent Pending

- For retrofit or new construction installation
- Universal housing compatibility
- Adjustable lumen output – 3 defined light levels
- Easy fit installation – Spring-action housing clips
- Universal voltage 120-277V
- Available in 2700K, 3000K, 3500K & 4000K CCT

40,000 H | 120-277V UNIVERSAL | LUMEN OUTPUT ADJUSTABLE | 5 YR WARRANTY | 80 CRI (Ra) | SEMI DIRECTIONAL

c UL us LISTED | c UL us CLASSIFIED | FC | lighting facts LED Product Partner | LM 79 | LM 80 | TM 21 | IES

COMMERCIAL DOWNLIGHT PRODUCT FEATURES

Adjustable Lumen Output

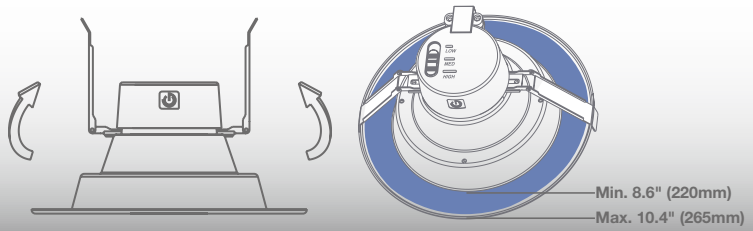
Fluorescent Equivalence Table

Power	Lumens	Equivalent
LOW-23.5W	2000	1X42W / 2X26W
MED-32W	2500	1X57W / 2X32W
HIGH-45W	3200	2X42W

This commercial downlight features adjustable lumen output for three distinct lumen levels equivalent to various CFL lamp combinations. Simply adjust the lamp power to the desired lumen output by sliding the selector switch on top of the fixture.

Easy-Fit Installation

The adjustable housing clips allow for installation in a large range of commercial and architectural housings ranging from 8.6''-10.4'' (220-265mm). These spring-action clips push up easily and fit securely for both retrofit and new construction installations.



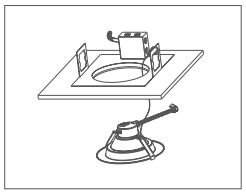
9.5'' CDL 45W TITANIUM LED SERIES

GREENCREATIVE

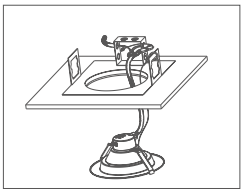
Ref.#:DS126-CDLA-45W-277V

SIMPLE RETROFIT OR ECONOMICAL NEW CONSTRUCTION INSTALLATION

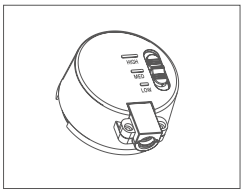
Retrofit Installation



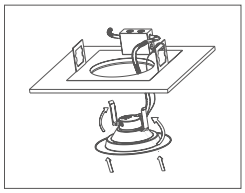
Attach safety clip



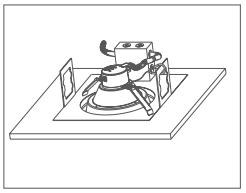
Bypass ballast & wire to j-box



Adjust lumens to desired output

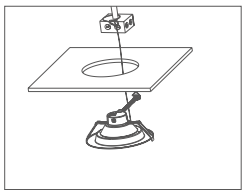


Push clips up & install into fixture

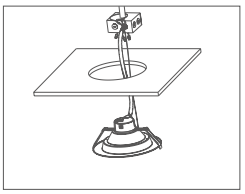


Ensure fixture is flush. Installation is complete

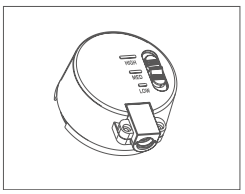
New Construction Installation



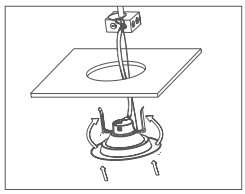
Attach safety clip



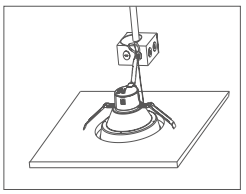
Wire to j-box



Adjust lumens to desired output



Push clips up & install into opening



Ensure fixture is flush. Installation is complete

SPECIFICATIONS

Product Model	57878 45CDLA9.5/827/277V	57879 45CDLA9.5/830/277V	57880 45CDLA9.5/835/277V	57881 45CDLA9.5/840/277V
Type	9.5'' Commercial Downlight	9.5'' Commercial Downlight	9.5'' Commercial Downlight	9.5'' Commercial Downlight
Power (W)	23.5 / 32 / 45	23.5 / 32 / 45	23.5 / 32 / 45	23.5 / 32 / 45
Voltage - Frequency	120-277V 50-60Hz	120-277V 50-60Hz	120-277V 50-60Hz	120-277V 50-60Hz
Color Temp. (ANSI)	Soft White 2700K	Warm White 3000K	Neutral White 3500K	Cool White 4000K
CRI (Ra) (typ.)	80	80	80	80
Typical lumens (lm)	1860 / 2325 /2975	2000 / 2500 / 3200	2000 / 2500 / 3200	2000 / 2500 / 3200
Efficacy (LPW)	79 / 73 / 66	85 / 78 / 71	85 / 78 / 71	85 / 78 / 71
Beam Angle	110°	110°	110°	110°
Dimmable	No	No	No	No
Power Factor	0.9	0.9	0.9	0.9
Rated Lifetime - L70 (hrs.)	40,000	40,000	40,000	40,000
Dia. x MOL	11.26''x4.84'' (286x123mm)	11.26''x4.84'' (286x123mm)	11.26''x4.84'' (286x123mm)	11.26''x4.84'' (286x123mm)
Weight (lb. / g)	2.02 lb. / 915g	2.02 lb. / 915g	2.02 lb. / 915g	2.02 lb. / 915g

* Suitable for damp locations. Not for use where directly exposed to weather or water
** Full installation guide and more details available on website

Green Creative - LED commercial downlight : 45CDLA9.5/840/277V

Specifications

ENERGY STAR Partner:	Green Creative
Indoor/Outdoor:	Indoor
Fixture Type:	Downlight Recessed
Technology:	LED
Total Light Output (lumens):	3200
Appearance/Correlated Color Temperature (K):	4000/4100K
Total Input Power (Watts):	45.0
Energy Efficiency - Measured Outside the Fixture (lumens/Watt):	89.9
Power Factor:	0.99
Color Quality (CRI):	86
Light Source Life (hrs):	40000
Can Size(s):	>= 9
Can Rating(s):	Type Non-IC
Special Features:	Non-Dimmable
Light Source Connection/Base Type:	N/A
Date Available On Market:	03/20/2016
Date Certified:	04/27/2016
Markets:	United States, Canada

PL H 9.5W BYP TITANIUM LED SERIES

GREENCREATIVE

PL EDGE SERIES

PRO

9.5W REPLACES

26W CFL

60% Energy Savings

- **HYBrid installation - DIRect or BYPass**
- **Compatible with magnetic ballasts - DIRect installation**
- **Built-in universal voltage driver - Bypass installation**
- **Compatible with G24d, GX24d, G24q & GX24q bases**
- **Exceptional efficacy 100 LPW**
- **Lasts 4 times longer than CFL**

50,000 H

MAGNETIC BALLAST COMPATIBLE

120-277V UNIVERSAL

5 YR WARRANTY

82 CRI (Ra)

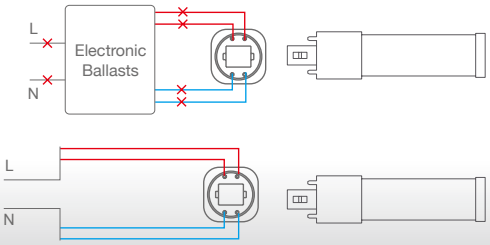
SEMI DIRECTIONAL

CLASSIFIED cULus FC lighting facts LED Product Partner LM 79 LM 80 TM 21 IES

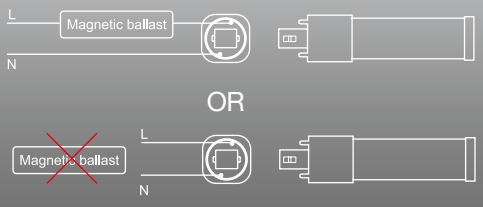
PL PRODUCT FEATURES

BYPass Installation - Electronic Ballasts

This PL H lamp is not compatible with electronic ballasts and requires bypassing the ballast during installation. The lamp runs directly off line voltage to eliminate compatibility problems, incidental power loss, lifetime issues, and maintenance costs associated with ballasts.



HYBrid Installation - DIRect or BYPass - Magnetic Ballasts



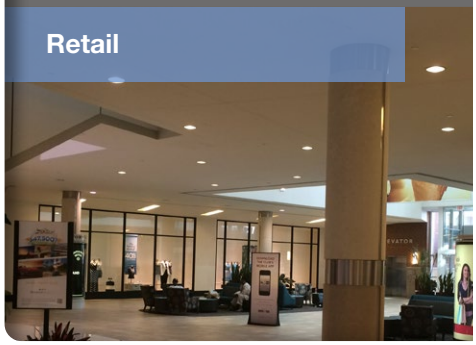
When used with a magnetic ballast, the PL H can function as a plug & play lamp and operate with the existing ballast. If the ballast is not compatible, it can be bypassed and the lamp can run directly off line voltage.

PL H 9.5W BYP TITANIUM LED SERIES

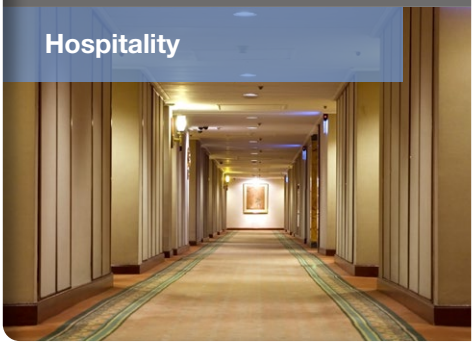
GREENCREATIVE

APPLICATIONS

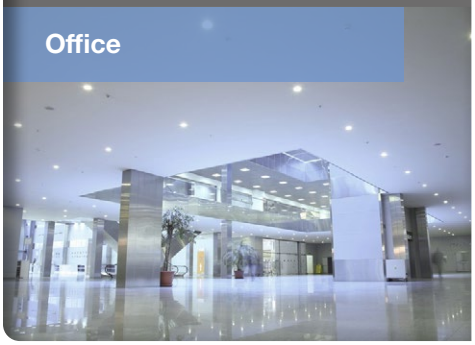
Retail



Hospitality



Office



Ref.#: DS182-PLH-9.5W-BYP-291216

Base:	G24d, GX24d, G24q & GX24q (2/4-pin CFL)
Voltage:	Magnetic ballast compatible 120-277V
Dimmable:	No
PF:	0.9
Lifetime (L70):	50,000 hrs
Weight:	0.18lb / 82g

SPECIFICATIONS

Model	Product	Power (W)	CCT	CRI (typ.)	Lumens	LPW	Beam Angle
9.5PLH/827/BYP	28354	9.5	Soft White 2700K	82	870	92	110°
9.5PLH/830/BYP	28355	9.5	Warm White 3000K	82	920	97	110°
9.5PLH/835/BYP	28356	9.5	Neutral White 3500K	82	920	97	110°
9.5PLH/840/BYP	28357	9.5	Cool White 4000K	82	950	100	110°

* Suitable for damp locations. Not for use where directly exposed to weather or water
** Not intended for use in enclosed fixtures
*** Full installation guide and more details available on website

HID LED 80W TITANIUM LED SERIES

GREENCREATIVE

PRO

80W REPLACES

175-250W HID

70% Energy Savings

$181 Savings per lamp*

- **Direct line voltage 120-277V - Not compatible with ballasts**
- **Designed for use in post top applications**
- **Compatible with EX39 & E39 sockets**
- **Fully omnidirectional 320° beam angle**
- **Available in 4000K & 5000K CCT**
- **Suitable for use in totally enclosed fixtures**

50,000 H

120-277V UNIVERSAL

OMNI DIRECTIONAL

5 YR WARRANTY

80 CRI (Ra)

ENCLOSED**

LM 79 LM 80 TM 21 IES

HID LED PRODUCT FEATURES

Suitable for Enclosed Fixtures

This HID LED lamp replaces a 175-250W HID and is suitable for use in totally enclosed fixtures. Its high lumen output and exceptional efficacy make it an ideal choice for outdoor post top applications.

CoolSink Technology

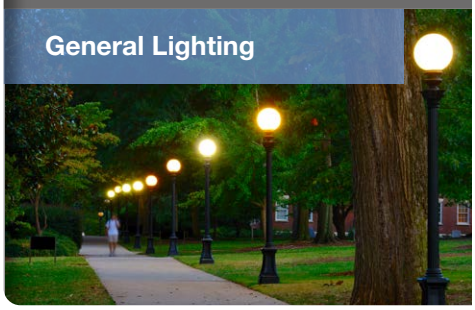
The CoolSink passive cooling system allows air to flow freely through the lamp. This unique design uses an increased cooling surface area to reduce the operating temperature of the LED and power supply, thus resulting in longer lamp life and lumen maintenance.

HID LED 80W TITANIUM LED SERIES

GREENCREATIVE

APPLICATIONS

General Lighting



Teardrop Lighting

Post Top Lighting

Ref.#: DS148-HID-LED-80W-277V-050617

SPECIFICATIONS

Product Model	57948 80HID/840/277V/EX39/R	57949 80HID/850/277V/EX39/R
Type	HID LED	HID LED
Base	EX39 (Compatible with E39)	EX39 (Compatible with E39)
Power (W)	80	80
Voltage - Frequency	120-277V	120-277V
Color Temp. (ANSI)	Cool White 4000K	Daylight 5000K
CRI (Ra) (typ.)	80	80
Bare Lamp lumens (lm)	9300	9600
Bare Lamp efficacy (LPW)	116	120
Fixture lumens (lm)* **	7960	7960
Fixture efficacy (LPW)* **	97	97
Beam Angle	320°	320°
Dimmable	No	No
Power Factor	0.9	0.9
Rated Lifetime - L70 (hrs.)	50,000	50,000
Temperature Rating	-4°F/-20°C - 95°F/35°C	-4°F/-20°C - 95°F/35°C
Dia. x MOL	5.87''x10.16'' (148x258mm)	5.87''x10.16'' (148x258mm)
Weight (lb. / g)	3.8lbs / 1724g	3.8lbs / 1724g

HID EQUIVALENCE

GREEN CREATIVE HID LED		Metal Halide		Mercury Vapor		High Pressure Sodium	
Power	**Lumens**	**Power**	**Mean Lumens**	**Power**	**Mean Lumens**	**Power**	**Mean Lumens**
80W	**9600**	**175W**	**10,800**	**250W**	**11,000**	**100W**	**8000**

* Savings per fixture based on $0.11 / kw energy cost, 12 hrs / $12 HID with 10,000-hr lifetime, $70 ballast, $285 LED HID with 50,000 hr lifetime
** Suitable for use in totally enclosed fixtures

*** Fixture lumens and efficacy based on DLC testing in Post Top fixture with prismatic diffuser: GE Patriarch Luminaire
**** Suitable for damp locations. Not for use where directly exposed to weather or water
***** Not suitable for use in horizontal applications

HID LED 16.5W HO 277V TITANIUM LED SERIES

GREENCREATIVE

ENERGY STAR

PRO

Optional Lamp Extender

16.5W REPLACES

50-70W HID

70% Energy Savings

$72 Savings per lamp*

- **Direct line voltage 120-277V - Not compatible with ballasts**
- **Compact form factor - Ideal for bollards & post tops**
- **Exceptional efficacy 121 LPW in Cool White**
- **Frosted diffuser maintains low glare**
- **Optional lamp extender available for use in larger fixtures**
- **Suitable for use in totally enclosed fixtures**

40,000 H

120-277V UNIVERSAL

121 LPW EFFICACY

5 YR WARRANTY

82 CRI (Ra)

ENCLOSED**

c UL us LISTED

FC

LM 79 LM 80 TM 21 IES

HID LED PRODUCT FEATURES

Suitable for Enclosed Fixtures

This HID LED lamp replaces a 50-70W HID and is suitable for use in enclosed fixtures. Its high lumen output and exceptional efficacy make it an ideal choice for bollard, post top and other outdoor applications. An optional lamp extender is also available for use in larger fixtures.

Omnidirectional Lighting

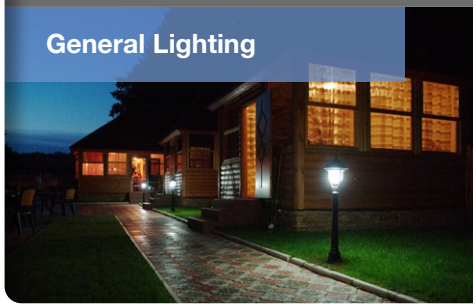
This HID LED emits 330° of uniform light and meets ENERGY STAR requirements. Its compact form factor and omnidirectional output provides a fuller distribution than other LED lamps.

HID LED 16.5W HO 277V TITANIUM LED SERIES

GREENCREATIVE

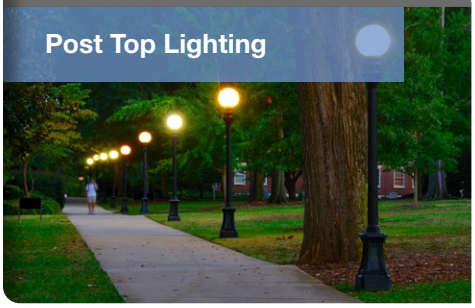
APPLICATIONS

General Lighting



Bollard Lighting

Post Top Lighting



Ref.#: DS180-A21-16.5W-277V-100217

SPECIFICATIONS

Product Model	58238 16.5A21/830/277V	58239 16.5A21/840/277V	58240 16.5A21/850/277V
Type	HID LED	HID LED	HID LED
Base	E26	E26	E26
Power (W)	16.5	16.5	16.5
Voltage - Frequency	120-277V 50/60Hz	120-277V 50/60Hz	120-277V 50/60Hz
Color Temp. (ANSI)	Warm White 3000K	Cool White 4000K	Daylight 5000K
CRI (Ra) (typ.)	82	82	82
Typical lumens (lm)	2000	2000	2050
Efficacy (LPW)	121	121	124
Beam Angle	330°	330°	330°
Dimmable	No	No	No
Power Factor	0.9	0.9	0.9
Rated Lifetime - L70 (hrs.)	40,000	40,000	40,000
Dia. x MOL	2.55''x5.00'' (65x127mm)	2.55''x5.00'' (65x127mm)	2.55''x5.00'' (65x127mm)
Weight (lb. / g)	0.50lb. / 227g	0.50lb. / 227g	0.50lb. / 227g

* Savings per lamp based on $0.11 / kw energy cost, 12 hrs / day lamp usage, $12 HID with 10,000-hr lifetime, $35 LED with 40,000-hr lifetime

** Suitable for use in totally enclosed fixtures

*** Suitable for damp locations. Not for use where directly exposed to weather or water

KBL Series

LED Low-Bay/High-Bay Luminaire

Product Description

KBL LED delivers 20,900(M) or 27,500(H) lumens, allowing for one-for-one replacement or fixture count reduction of 250W, 400W HID or up to six lamp 54W T5HO fixtures. With energy savings of up to 65% over traditional light sources, lightweight construction and multiple mounting options, the KBL is optimized for new construction or retrofit installations.

The KBL delivers even illumination with reflector choices of aluminum, clear acrylic, clear polycarbonate, or white acrylic. Optional lenses offer enhanced uplight and maximum uniformity, making it ideal for a variety of applications including retail, gymnasiums, light manufacturing, and warehouses.

Applications: Retail, gymnasiums (aluminum or polycarbonate reflector), industrial, manufacturing and warehouse spaces.

Performance Summary

Initial Delivered Lumens: 20,900 or 27,500 lumens

Operating Temperature Range: M Lumen Package: -40˚C to 50˚C (-40˚F to +122˚F); H Lumen Package: -40˚C to 40˚C (-40˚F to +104˚F)

Efficacy: Up to 150 LPW

CRI: 70, 80+

CCT: 3000K, 3500K, 4000K, 5000K

Input Voltage: 120-277 VAC or 347-480 VAC (without step-down transformer)

L_{70} Lifetime: > 100,000 hours at maximum operating temperature

Limited Warranty†: 10 years on luminaire

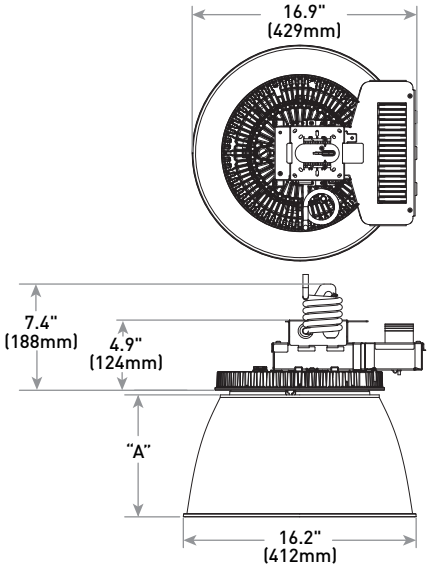
Universal Mounting: Accommodates J-Box, pendant, hook, cord & plug

Weight: Maximum 14 lbs. (6.4kg)

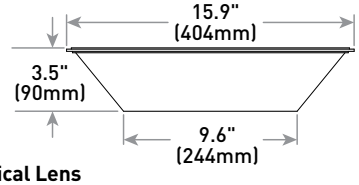
Controls: 0-10V dimming to 10% or Multi-Level Occupancy

† See http://lighting.cree.com/warranty for warranty terms

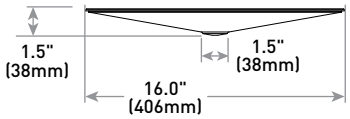
Shown Fully Assembled with Prismatic Reflector and Universal Mount



Drop Lens



Clear Conical Lens



Reflector	"A" Height
CXBA16N (Aluminum)	9.0" (229mm)
CXBP16 (Clear Prismatic)	8.5" (216mm)
CXBW16 (White Acrylic)	8.5" (216mm)
CXBC16 (Clear Polycarbonate)	8.5" (216mm)

Ordering Information

Example: KBL-A-UV-H-40K-7-UL-10V

KBL	A	UV					
Product	**Version**	**Mounting**	**Lumen Package***	**CCT**	**CRI**	**Voltage**	**Controls**
KBL	**A**	**UV** Universal Mount: hook and cord with 6ft whip, adaptor plate for J-box and pendant	**M** 20,900 Lumens **H** 27,500 Lumens	**30K** 3000K **40K** 4000K **35K** 3500K **50K** 5000K	**7** 70 CRI **8** 80 CRI	**UL** 120-277V **UH** 347-480V	**10V** 0-10V Dimming **ML** Multi-Level - Refer to ML install instructions for details

* Lumen Package codes identify approximate light output only. Actual lumen output levels vary depending on CCT and reflector/lens selection. Refer to Delivered Lumens & Electrical Data and Reflector Illumination Performance tables for specific lumen values

Rev. Date: V1 11/27/2017

US: lighting.cree.com T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- Die cast aluminum heatsink
- Luminaire is post-painted with white powder coat finish
- IP65 optics with tempered glass lens protect LEDs while keeping the dust out
- Low-profile, lightweight design provides ease of installation
- Mounting choices of direct J-Box/pendant and hook, cord & plug
- J-box mount mounts directly over existing 4" (102mm) single gang square, rectangular and octagonal junction boxes for direct mount
- J-box mount has provision to accept ¾ IP pendant (by others)
- UV mount is provided with factory installed spring lock hook for mounting and factory installed 6' (1.8m) 16/3 AWG white power cord
- Factory calibrated to hang straight
- Designed for downlight applications only
- **Weight:** Maximum 14 lbs. (6.4kg)

OPTICAL SYSTEM

- 16" (406mm) all reflectors
- LED system delivers proper uniformity & spacing

ELECTRICAL SYSTEM

- Integral, high-efficiency driver
- **Input Voltage:** 120-277V or 347-480V 50/60Hz
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- **Operating Temperature Range:** M Lumen Package: -40˚C to 50˚C (-40˚F to +122˚F); H Lumen Package: -40˚C to 40˚C (-40˚F to +104˚F)
- **Transient Protection:** 6kV/3kA tested in accordance to IEEE/ANSI
- When code dictates fusing, a slow blow fuse or type C/D breaker should be used to address inrush current

0-10V DIMMING

- Continuous dimming to 10% with 0-10V DC control protocol
- 10V Source Current: 0.15mA
- Use only lighting controls with neutral connection or controls intended for use with LED fixtures
- Reference dimming document for additional information

MULTI-LEVEL OPTION

- Passive infrared (PIR) occupancy sensing
- High/low occupancy, dim to min of 30%
- Covers mounting heights from 15-45' (4.6-13.7 m). Detects walking to 35' (10.8 m) and fork lifts to 45' (13.7 m)
- Available with UL and UH voltages
- Refer to KBL install instructions for details on sensor functionality, operation and lumen and power multipliers

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed (UL1598; UL8750)
- Suitable for damp locations
- Requires minimum 90°C supply conductors
- Not intended for use in environments containing airborne corrosive agents such as chemical solvents, cleaners, or cutting fluids
- IP65 rated LED optics
- Meets FCC Part 15, Subpart B, Class A standards for conducted and radiated emissions
- Assembled in the U.S.A. of U.S. and imported parts
- DLC and DLC Premium qualified versions available. Some exceptions apply. Please refer to https://www.designlights.org/search/ for most current information

Delivered Lumens & Electrical Data*

Lumen Package	CCT	Delivered Lumens**		System Watts	Efficacy (LPW at 70CRI)	Total Current (A)					
		70 CRI	80 CRI	120-480V		120V	208V	240V	277V	347V	480V
M	3000K	21,300	18,800	142	150	1.20	0.69	0.60	0.51	0.41	0.29
	3500K	22,000	19,700		155						
	4000K	22,100	20,500		156						
	5000K	22,100	20,700		156						
H	3000K	28,000	24,700	189	148	1.60	0.92	0.80	0.68	0.54	0.39
	3500K	28,800	25,900		152						
	4000K	29,100	26,900		154						
	5000K	29,000	27,200		153						

* Data provided at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-480V +/- 10%.
** Initial delivered lumen values based on luminaire without reflector. Refer to reflector Illumination Performance table for lumen multipliers when using reflector accessory

Reflector Uplight Illumination Performance

Reflector	% of Uplight	Lumen Multiplier
CXBA16N (Aluminum)	0%	0.86
CXBA16N w/CLA16 (Aluminum w/Clear Conical Lens)	0%	0.76
CXBA16N w/DLA16 (Aluminum w/Clear Drop Lens)	2%	0.77
CXBP16 (Clear Prismatic)	3%	0.96
CXBP16 w/CL16 (Clear Prismatic w/Clear Conical Lens)	6%	0.93
CXBP16 w/DL16 (Clear Prismatic w/Clear Drop Lens)	8%	0.93
CXBW16 (White Acrylic)	13%	0.93
CXBW16 w/CL16 (White Acrylic w/Clear Conical Lens)	16%	0.88
CXBW16 w/DL16 (White Acrylic w/Clear Drop Lens)	16%	0.90
CXBC16 (Clear Polycarbonate)	2%	0.89
CXBC16 w/CL16 (Clear Polycarbonate w/Clear Conical Lens)	5%	0.85
CXBC16 w/DL16 (Clear Polycarbonate w/Clear Drop Lens)	7%	0.84

Reference http://lighting.cree.com/products/indoor/high-bay-low-bay/kbl-series for detailed photometric data

KBL Series Ambient Adjusted Lumen Maintenance[1]

Ambient	Initial LMF	36K hr Projected[2] LMF	50K hr Calculated[3] LMF	75K hr Calculated[3] LMF	100K hr Calculated[3] LMF
25˚C (77˚F)	1.00	0.95	0.94	0.93	0.92
30˚C (86˚F)	0.99	0.94	0.93	0.92	0.91
35˚C (95˚F)	0.98	0.93	0.92	0.91	0.90
40˚C (104˚F)	0.97	0.92	0.91	0.90	0.90
45˚C (113˚F)	0.96	0.91	0.90	0.89	0.89
50˚C (122˚F)	0.95	0.90	0.89	0.89	0.88

[1] Lumen maintenance values at 25˚C are calculated per TM-21 based on LM-80 data and in-situ luminaire testing. Luminaire ambient temperature factors (LATF) have been applied to all lumen maintenance factors
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT) i.e. the packaged LED chip)
Note: H Lumen package is only rated up to 40˚C

Accessories

Reflector

CXBA16N (Single Pack)
CXBA16N-MP (Multi-Pack)
- 16" (406mm) Aluminum

CXBP16 (Single Pack)
CXBP16-MP (Multi-Pack)
- 16" (406mm) Clear Acrylic
- Acrylic reflector is not impact resistant nor intended for use unprotected in a gymnasium

CXBW16 (Single Pack)
CXBW16-MP (Multi-Pack)
- 16" (406mm) White Acrylic
- Acrylic reflector is not impact resistant nor intended for use unprotected in a gymnasium

CXBC16 (Single Pack)
CXBC16-MP (Multi-Pack)
- 16" (406mm) Clear Polycarbonate
- Suitable for use in gymnasiums; WG-AP wire guard recommended

Notes:
- Single pack SKUs ship as one reflector per box
- Multi-pack SKUs require a minimum order of 10 pieces or more, and ship together in as few boxes as possible

Reflector Accessories

16" (406mm) Wire Guards
WG-A
- For Aluminum Reflector

WG-AP
- For Acrylic and Polycarbonate Reflectors

Note: Lenses and wire guard accessories can't be used together

16" (406mm) Clear Prismatic Drop Acrylic Lenses
DLA16
- For Aluminum Reflector

DL16
- For Acrylic Reflector

16" (406mm) Clear Conical Acrylic Lenses
CLA16
- For Aluminum Reflector

CL16
- For Acrylic Reflector

Safety Cables

Galvanized Safety Cables
SC-5
- 5.0' (1.5m) Cable

SC-10
- 10.0' (3.0m) Cable

Field-Installed NEMA® Plugs

AP-515P
- 15 amp 120V Straight Blade Plug

AP-L515P
- 15 amp 120V Twist Lock Plug

AP-L615P
- 15 amp 240V Twist Lock Plug

AP-L715P
- 15 amp 277V Twist Lock Plug

AP-L2420P
- 20 amp 347V Twist Lock Plug

AP-L820P
- 20 amp 480V Twist Lock Plug

Optional Reflectors/Lens

shown fully assembled with universal mount

Aluminum Reflector w/Drop Lens

Clear Prismatic Reflector

White Acrylic Reflector w/Conical Lens

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US: lighting.cree.com T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Cree® KBL Series

LED Low-Bay/High-Bay Luminaire

UP TO 150 LPW TO LIGHTEN THAT OVERHEAD

Exceptional Efficacy

The KBL Series High-Bay offers extreme efficacy in the industry's favorite form factor. Available in 18,000 and 24,000 nominal lumen packages, the KBL Series delivers up to 150 LPW while saving up to 65% energy over traditional light sources. Switching to LED has never been easier than with the KBL Series, offering you the ability to maximize rebates and virtually eliminate maintenance costs.

Industrial-Grade Reliability

The higher the mounting height, the higher the stakes. Built with industry-leading drivers and paired with our premium LED arrays, the KBL Series ensures worry-free operation for years to come. Robust 6kV/3Ka transient protection, IP65 sealed optics and lumen maintenance over 100K hours make the KBL Series the fixture you can count on.

Versatile Design with Stylish Aesthetics

The KBL Series' clean lines and visually comfortable optics blend into any space while delivering the performance you expect. Customize the KBL Series to your space with your choice of aluminum, clear or white acrylic reflectors; optional bottom lenses maximize uplight to reduce dark ceilings and give your space a more open feel.

Remarkable Application Flexibility

The KBL Series is versatile and flexible enough for almost any space, whether new construction or retrofit - providing better light to support a safer, more productive environment. Its compact, lightweight construction and universal mounting option make the KBL Series ideal for retail, industrial, warehouse and manufacturing applications.

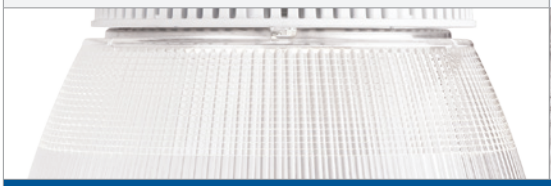
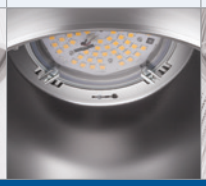
CREE™

KBL SERIES LED LOW-BAY/HIGH-BAY LUMINAIRE

At Cree, we're continuing to improve high-bay/low-bay LED performance with the introduction of the KBL Series, delivering extreme energy savings and exceptional lumen maintenance without sacrificing what's important — better light and near maintenance-free operation. With multiple lumen, CRI and CCT packages; reflectors and lenses, the KBL Series makes selecting the ideal solution for your application quick and easy — whether it's grocery, gymnasium, industrial, retail, manufacturing or warehouse. Lightweight construction and universal mounting make installations near effortless, getting you back to what's important. And with high lumens per watt that qualify for DLC Premium certification, the Cree® KBL Series is exceptionally rebate friendly!

PERFORMANCE SUMMARY
Nominal Delivered Lumens: 18,000 or 24,000 lumens
Input Power: 142 or 189 watts
Efficacy: Up to 150 LPW
CRI: 70 or 80+
CCT: 3000K, 3500K, 4000K, 5000K
Input Voltage: 120-277 VAC or 347-480 VAC
Limited Warranty: 10 years
Mounting: Universal mounting easily converts to support J-box, pendant or hook & cord installations
Weight: Maximum 14 lbs.
Dimming: 0-10V dimming to 10% or multi-level occupancy

Shown with Wire Guard

REFLECTOR OPTIONS	Clear Prismatic Acrylic	White Diffuse Acrylic	Matte Spun Aluminum	Clear Prismatic Polycarbonate
				
LENS OPTIONS FOR MAXIMUM UPLIGHT & UNIFORMITY				
Open Reflector	**3%**	**13%**	**0%**	**2%**
Clear Acrylic Prismatic Drop Lens	**8%**	**16%**	**2%**	**7%**
Clear Acrylic Conical Bottom Lens	**6%**	**16%**	**0%**	**5%**

Visit **lighting.cree.com** or contact a Cree lighting representative to learn more

info@cree.com | 800.236.6800

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Dimming

Diva® 0–10V

- 0–10V dimmer for fluorescent and LED fixtures

Two models available:

- DVSTV
  - Controls 120–277V without a power pack
  - Provides 3-way preset switching functionality
- DVTV
  - Requires a power pack
  - Use with a power pack for Class 2 installations, with wired occupancy sensors, for 347V operation, and for loads greater than 8A

Voltage

- DVSTV
  - 8A, 120-277V
- DVTV
  - 16A with PP-DV, 120-277V
  - 16A with PP-347, 347V

Ideal for applications requiring 0–10V fixtures, such as private offices and conference rooms

The Lutron Advantage

- Patented technology extends relay life to 10 years
- Low-end and high-end trim in one product
- No derating for 277V installations
- No neutral

Energy-saving strategies

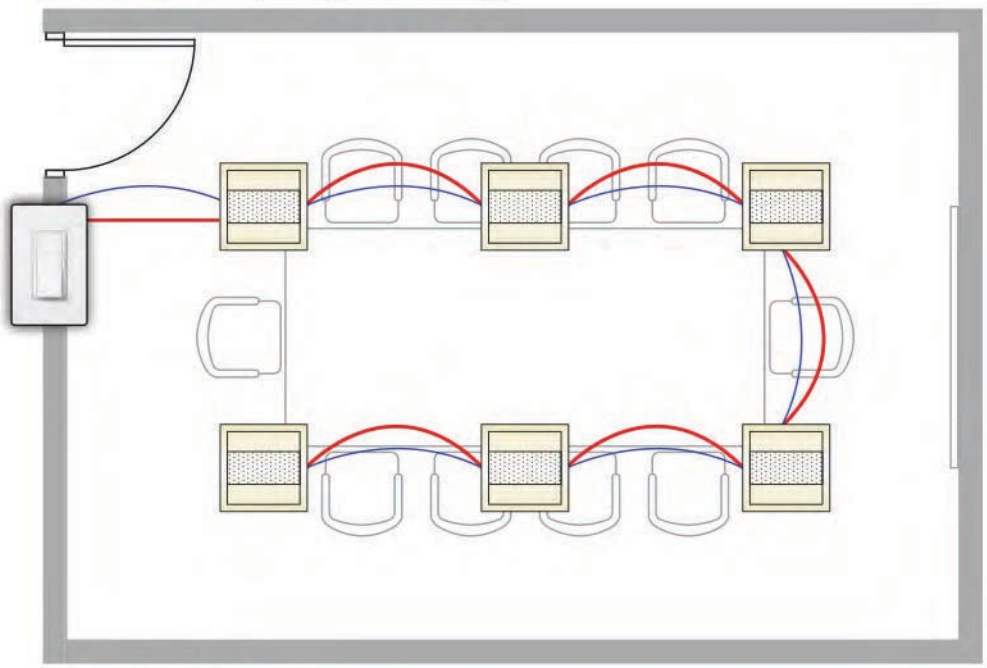
- Dimming
- High-end trim

Codes met

- Automatic shut-off with wired occupancy sensors through a power pack
- Area control
- Multi-level lighting control

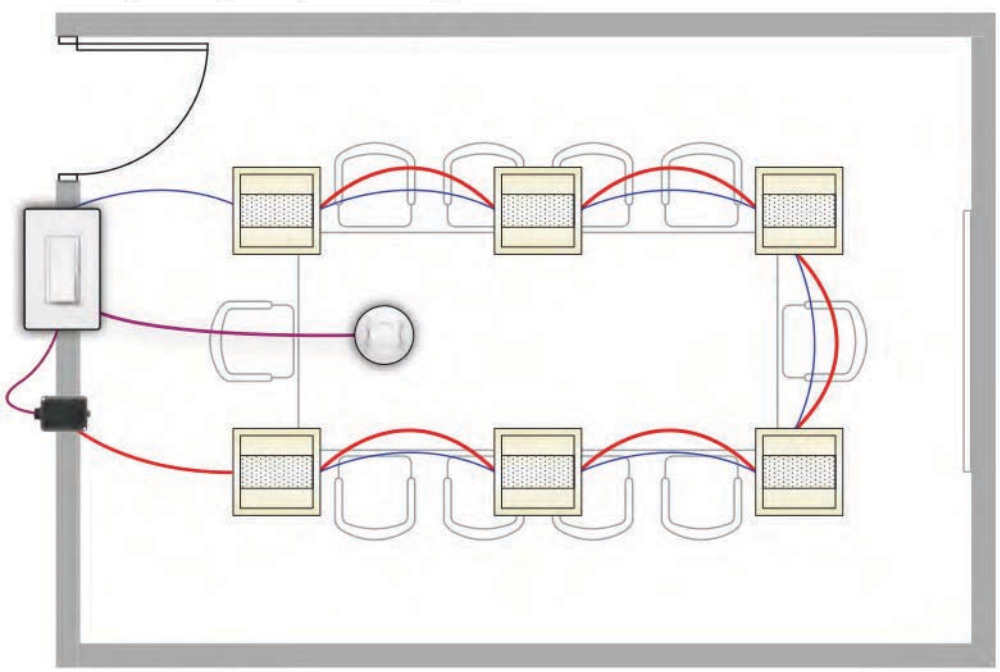
Application examples: Conference room

Without power pack (DVSTV Only)



— Line-voltage wiring
— Low-voltage wiring

With power pack (DVTV Only)



— Line-voltage wiring
— Low-voltage wiring
— Occupancy signal

ALED3T78

Specification Grade Area lights available in IES Type III distributions. For use in parking lots, roadways, pathways and general area lighting. Mounts to 4" square steel poles at 15-25'. Designed to replace 250W Metal Halide Area Lights. Patent Pending thermal management system. 5 Year Warranty.

Color: Bronze

Weight: 30.4 lbs

Project:	Type:
Prepared By:	Date:

Driver Info		LED Info	
Type:	Constant Current	Watts:	78W
120V:	0.66A	Color Temp:	5100K (Cool)
208V:	0.41A	Color Accuracy:	67 CRI
240V:	0.35A	L70 Lifespan:	100000
277V:	0.30A	Lumens:	6,911
Input Watts:	78W	Efficacy:	88 LPW
Efficiency:	99%		

Technical Specifications

Optical

Lumen Maintenance:

100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

Replacement:

The ALED78 replaces 250W Metal Halide Area Lights.

BUG Rating:

B1 U0 G2

Construction

IES Classification:

The Type III distribution is ideal for roadway, general parking and other area lighting applications where a larger pool of lighting is required. It is intended to be located near the side of the area, allowing the light to project outward and fill the area.

IP Rating:

Ingress Protection rating of IP66 for dust and water.

Ambient Temperature:

Suitable for use in 40°C ambient temperatures.

Cold Weather Starting:

The minimum starting temperature is -40°F/-40°C.

Thermal Management:

Superior heat sinking with external Air-Flow fins.

Effective Projected Area:

EPA = 0.75

Housing:

Die cast aluminum housing, lens frame and mounting arm.

Reflector:

Specular vacuum-metallized polycarbonate

Gaskets:

High temperature silicone gaskets.

Finish:

Our environmentally friendly polyester powder coatings are formulated for high-durability and long-lasting color, and contains no VOC or toxic heavy metals.

Green Technology:

Mercury and UV free.

For use on LEED Buildings:

IDA Dark Sky Approval means that this fixture can be used to achieve LEED Credits for Light Pollution Reduction.

LED Characteristics

LEDs:

Six (6) multi-chip, 13W, high-output, long-life LEDs.

Color Consistency:

3-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color.

Color Stability:

LED color temperature is warrantied to shift no more than 200K in CCT over a 5 year period.

Color Uniformity:

RAB's range of CCT (Correlated color temperature) follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2015.

Electrical

Driver:

Constant Current, Class 2, 2000mA, 100-277V, 50-60Hz, 1.1A, Power Factor 99%

THD:

5.3% at 120V, 13.3% at 277V

Surge Protection:

4kV

Surge Protector:

ALED78 is available with a 6kV surge protector (SP6). SP6 available .

Listings

IESNA LM-79 & IESNA LM-80 Testing:

RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and 80, and have received the Department of Energy "Lighting Facts" label.

Dark Sky Approved:

The International Dark Sky Association has approved this product as a full cutoff, fully shielded luminaire.

UL Listing:

Suitable for wet locations as a downlight.

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Technical Specifications (continued)

Listings

DLC Listed:

This product is on the Design Lights Consortium (DLC) Qualified Products List and is eligible for rebates from DLC Member Utilities.
DLC Product Code: P0000179S

Other

California Title 24:

See ALED3T78/D10, ALED3T78/BL, ALED3T78/PCS, ALED3T78/PCS2, or ALED3T78/PCT for a 2013 California Title 24 compliant product. Any additional component requirements will be listed in the Title 24 section under technical specifications on the product page.

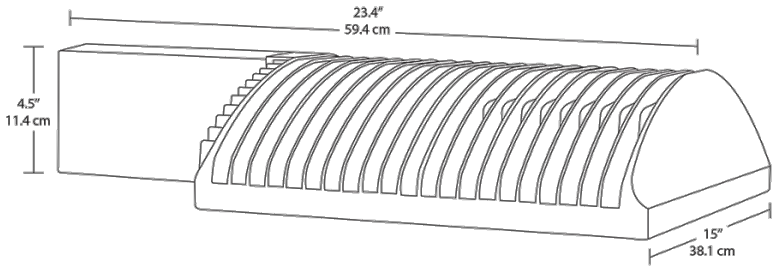
Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish.

Patents:

The ALED design is protected by patents in the U.S. Pat. 668,370, Canada Pat. 144956, China ZL201230100154.X, and Mexico Pat. 38423. Pending patents in Taiwan.

Dimensions



Features

- High output LED light engine
- Maintains 70% of initial lumens at 100,000 hours
- Weatherproof high temperature silicone gaskets
- Superior heat sinking with die cast aluminum housing and external fins
- Replaces 250W MH area lights
- 5-year warranty

Ordering Matrix

Family	Distribution	Watts	Mount	Color Temp	Finish	Voltage	Photocell	Dimming	Sensor	Bi-Level
ALED										
	2T = Type II **3T** = Type III **4T** = Type IV	**78** = 78W	= Arm **SF** = Slipfitter	= 5000K (Cool) **Y** = 3000K (Warm) **N** = 4000K (Neutral)	= Bronze **W** = White **RG** = Gray	= 120-277V **/480** = 480V	= No Photocell **/PC** = 120V Button **/PC2** = 277V Button **/PCS** = 120V Swivel **/PCS2** = 277V Swivel **/PCT** = 120-277V Twistlock **/PCS4** = 480V Swivel	= No Dimming **/D10** = Dimmable	**/WS2** = Multi-Level Motion Sensor (Only available for 120-277V with /D10 for 78W)	= No Bi-Level **/BL** = Bi-Level

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FFLED39N

Rectangular shaped LED floodlight designed to replace 150W Metal Halide. Patent Pending airflow technology ensures long LED and driver lifespan. Use for building facade lighting, sign lighting, LED landscape lighting and instant-on security lighting.

Color: Bronze Weight: 12.5 lbs

Project:	Type:
Prepared By:	Date:

Driver Info		LED Info	
Type:	Constant Current	Watts:	39W
120V:	0.35A	Color Temp:	4000K
208V:	0.20A	Color Accuracy:	71 CRI
240V:	0.18A	L70 Lifespan:	100000
277V:	0.15A	Lumens:	5651
Input Watts:	42W	Efficacy:	134 LPW
Efficiency:	92%		

Technical Specifications

LED Characteristics

Lifespan:

100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

LEDs:

Two multi-chip, 26Watt high performance LEDs.

Color Consistency:

3-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color.

Color Stability:

LED color temperature is warrantied to shift no more than 200K in CCT over a 5 year period.

Color Uniformity:

RAB's range of CCT (Correlated Color Temperature) follows the guidelines of the American National Standard for (SSL) Products, ANSI C78.377-2015.

Listings

DLC Listed:

This product is on the Design Lights Consortium (DLC) Qualified Products List and is eligible for rebates from DLC Member Utilities.
DLC Product Code:_P0000173J

IESNA LM-79 & LM-80 Testing:

RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80, and have received the Department of Energy "Lighting Facts" label.

UL Listing:

Suitable For Wet Locations. Suitable for ground mounting.

Construction

IP Rating:

Ingress Protection rating of IP66 for dust and water

Ambient Temperature:

SuitableFor use in 40°C (104°F) ambient temperatures.

Cold Weather Starting:

Minimum starting temperature is -40°C (-40°F)

Thermal Management Housing:

Superior heat sinking with external Air-Flow fins.

Mounting:

Heavy-duty mounting arm with "O" ring seal & stainless steel screw.

Effective Projected Area:

EPA = 0.65

Reflector:

Specular vacuum-metallized polycarbonate

Gaskets:

High-temperature silicone gaskets

Finish:

Formulated for high-durability and long lasting color.

Green Technology:

Mercury and UV free. RoHS compliant components. Polyester powder coat finish formulated without the use of VOC or toxic heavy metals.

Threaded Size:

1/2" threaded arm.

Optical

NEMA Type:

NEMA Beam Spread of 7H x 6V

Electrical

Driver:

Constant Current, Class 2, 1050mA, 100-277V, 50/60Hz, 0.6A, Power Factor 99%

Surge Protection:

4kV

Other

California Title 24:

Select an FFLED39 model equipped with 0-10V driver (look for /D10 in the catalog #) for a 2013 California Title 24 compliant model.

Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish.

Patents:

The FFLED design is protected by U.S. Pat. D643,147, Canada Pat. 140798, China Pat. ZL201130171304.1, Mexico Pat. 36757 and pending patent in Taiwan.

American Bureau of Shipping (ABS) :

For use on Mobile Offshore Drilling Units (MODU) and shipping vessels.

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Technical Specifications (continued)

Other

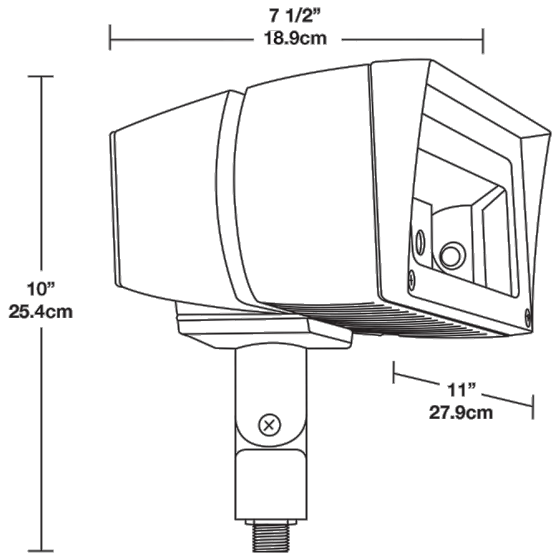
Equivalency:

Equivalent to 150W Metal Halide.

Buy American Act Compliance:

RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

Dimensions



Features

- Ultra efficient LED and optical design
- Replaces 150W MH floodlights
- 100,000 hour life based on LM-80 tests
- Air-flow technology heatsink
- 5-year warranty

Ordering Matrix

Family	Wattage	Mounting	Color Temp	NEMA Type	Finish	Driver	Photocell Options
FFLED	39		N				
	80 = 80W **52** = 52W **39** = 39W **26** = 26W	**Blank** = Swivel Arm **SF** = Slipfitter **T** = Trunnion	**Blank** = 5000K (Cool) **N** = 4000K (Neutral) **Y** = 3000K (Warm)	**Blank** = 7H x 6V **B55** = 5H x 5V **B44** = 4H x 4V	**Blank** = Bronze **W** = White	**Blank** = On/Off **/D10** = 0-10V Dimming **/480** = 480V On/Off (not available for 80W models)	**Blank** = No Option **/PC** = 120V Photocell **/PC2** = 277V Photocell **/PCS** = 120V Swivel Photocell **/PCS2** = 277V Swivel Photocell **/PCS4** = 480V Swivel Photocell

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FFLED52TNW

Rectangular shaped LED floodlight designed to replace 175W Metal Halide. Patent Pending airflow technology ensures long LED and driver lifespan. Use for building facade lighting, sign lighting, LED landscape lighting and instant-on security lighting.

Color: White Weight: 14.2 lbs

Project:	Type:
Prepared By:	Date:

Driver Info		LED Info	
Type:	Constant Current	Watts:	52W
120V:	0.45A	Color Temp:	4000K
208V:	0.27A	Color Accuracy:	71 CRI
240V:	0.24A	L70 Lifespan:	100000
277V:	0.21A	Lumens:	6917
Input Watts:	56W	Efficacy:	124 LPW
Efficiency:	93%		

Technical Specifications

Listings

UL Listing:

Suitable For Wet Locations. Suitable for mounting within 1.2M(4FT) of the ground.

IESNA LM-79 & LM-80 Testing:

RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80, and have received the Department of Energy "Lighting Facts" label.

LED Characteristics

Lifespan:

100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

LEDs:

Two multi-chip, 26Watt high performance LEDs.

Color Consistency:

3-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color.

Color Stability:

LED color temperature is warrantied to shift no more than 200K in CCT over a 5 year period.

Color Uniformity:

RAB's range of CCT (Correlated Color Temperature) follows the guidelines of the American National Standard for (SSL) Products, ANSI C78.377-2017.

Construction

IP Rating:

Ingress Protection rating of IP66 for dust and water

Ambient Temperature:

SuitableFor use in 40°C (104°F) ambient temperatures.

Cold Weather Starting:

Minimum starting temperature is -40°C (-40°F)

Thermal Management Housing:

Superior heat sinking with external Air-Flow fins.

Housing:

Die-cast aluminum housing, lens frame and mounting arm.

Threaded Size:

1/2" threaded arm.

Mounting:

Heavy-duty Trunnion mount with stainless steel hardware.

Effective Projected Area:

EPA = 0.65

Reflector:

Specular polycarbonate

Gaskets:

High-temperature silicone gaskets

Finish:

Formulated for high-durability and long lasting color.

Green Technology:

Mercury and UV free. RoHS compliant components. Polyester powder coat finish formulated without the use of VOC or toxic heavy metals.

Optical

NEMA Type:

NEMA Beam Spread of 7H x 6V

Electrical

Driver:

Constant Current, Class 2, 100-277V, 50/60 Hz, 4 kV surge protection, 120V: 0.45A, 208V: 0.27A, 240V: 0.24A, 277V: 0.21A

Other

California Title 24:

Select an FFLED52TN model equipped with a 0-10V driver (look for /D10 in the catalog #) for a 2013 California Title 24 compliant model.

Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish.

Patents:

The FFLED design is protected by U.S. Pat. D643,147, Canada Pat. 140798, China Pat. ZL201130171304.1, Mexico Pat. 36757 and pending patent in Taiwan.

American Bureau of Shipping (ABS) :

For use on Mobile Offshore Drilling Units (MODU) and shipping vessels.

Equivalency:

Equivalent to 175W Metal Halide.

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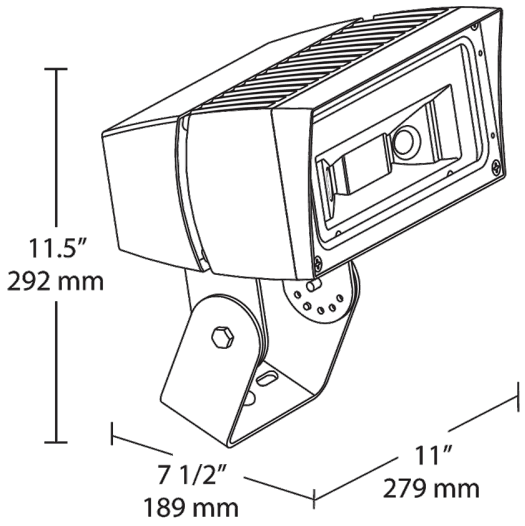
Technical Specifications (continued)

Other

Buy American Act Compliance:

RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

Dimensions



Features

- Ultra efficient LED and optical design
- Replaces 175W MH floodlights
- 100,000 hour life based on LM-80 tests
- Air-flow technology heatsink
- 5-year warranty

Ordering Matrix

Family	Wattage	Mounting	Color Temp	NEMA Type	Finish	Driver	Photocell Options
FFLED	52	T	N		W		
	80 = 80W **52** = 52W **39** = 39W **26** = 26W	**Blank** = Swivel Arm **SF** = Slipfitter **T** = Trunnion	**Blank** = 5000K (Cool) **N** = 4000K (Neutral) **Y** = 3000K (Warm)	**Blank** = 7H x 6V **B55** = 5H x 5V **B44** = 4H x 4V	**Blank** = Bronze **W** = White	**Blank** = On/Off **/D10** = 0-10V Dimming **/480** = 480V On/Off (not available for 80W models)	**Blank** = No Option **/PC** = 120V Photocell **/PC2** = 277V Photocell **/PCS** = 120V Swivel Photocell **/PCS2** = 277V Swivel Photocell **/PCS4** = 480V Swivel Photocell

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SLIM37

37, 57 and 62 Watt SLIM Wallpacks are designed to cover the footprint of most traditional wallpacks. They are suitable for mounting heights from 20' to 30', and replace HID Wattages from 200W MH to 320W MH. These ultra-high efficiency fixtures are available in cutoff or full cutoff models.

Color: Bronze

Weight: 7.5 lbs

Project:	Type:
Prepared By:	Date:

Driver Info		LED Info	
Type:	Constant Current	Watts:	37W
120V:	0.31A	Color Temp:	5000K (Cool)
208V:	0.19A	Color Accuracy:	75 CRI
240V:	0.16A	L70 Lifespan:	100000
277V:	0.14A	Lumens:	2,688
Input Watts:	37W	Efficacy:	73 LPW
Efficiency:	N/A		

Technical Specifications

Listings

UL Listing:

Suitable for wet locations. Wall Mount only.

IESNA LM-79 & LM-80 Testing:

RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80, and have received the Department of Energy "Lighting Facts" label.

DLC Listed:

This product is on the Design Lights Consortium (DLC) Qualified Products List and is eligible for rebates from DLC Member Utilities.
DLC Product Code: P0000171T

Construction

Footprint:

Designed to replace RAB HID WP1 wallpacks, both in size and footprint template, so upgrading to LED is easy and seamless.

IP Rating:

Ingress Protection rating of IP66 for dust and water.

Cold Weather Starting:

The minimum starting temperature is -40°F/-40°C.

Ambient Temperature:

Suitable for use in 40°C (104°F) ambient temperatures.

Thermal Management:

Superior thermal management with internal Air-Flow fins.

Housing:

Precision die-cast aluminum housing and door frame.

Mounting:

Die-cast back box with four (4) conduit entry points and knockout pattern for junction box or direct wall mounting. Hinged housing and bubble level for easy installation.

Cutoff:

Cutoff (7.5°)

Recommended Mounting Height:

Up to 20 ft.

Lens:

Microprismatic diffusion glass lens reduces glare and has smooth and even light distribution.

Reflector:

Specular thermoplastic.

Gaskets:

The unique design of the tight-lock gasket ensures no water or environmental elements will ever get inside the SLIM.

Finish:

Our environmentally friendly polyester powder coatings are formulated for high-durability and long-lasting color, and contains no VOC or toxic heavy metals.

Green Technology:

Mercury and UV free, and RoHS compliant.

LED Characteristics

LED:

Long-life, high-efficiency, micro-power, surface mount LEDs; binned and mixed for uniform light output and color.

Lifespan:

100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

Correlated Color Temp. (Nominal CCT):

5000K

Color Stability:

LED color temperature is warrantied to shift no more than 200K in CCT over a 5 year period.

Color Consistency:

7-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color.

Electrical

Driver:

Constant Current, 100-277V. 50/60Hz, 100-277VAC 0.6A, 4kV Surge Protection, 700mA, Power Factor 99.6%.

THD:

7.3% at 120V, 8.5% at 277V

Other

HID Replacement Range:

The SLIM37 can be used to replace 200W MH based on delivered lumens.

Accessories:

Available accessories include polyshield and wire guard. Click to see all accessories.

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Technical Specifications (continued)

Other

California Title 24:

See SLIM37/BL for a 2013 California Title 24 compliant product. Any additional component requirements will be listed in the Title 24 section under technical specifications on the product page.

Patents:

The design of the SLIM™ is protected by patents pending in US, Canada, China, Taiwan and Mexico.

Warranty:

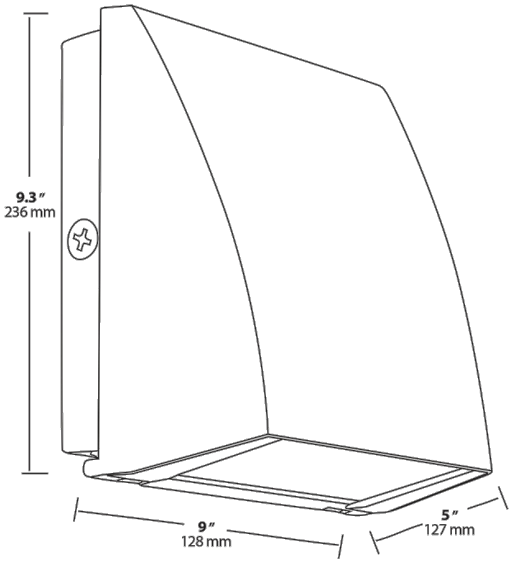
RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish.

Optical

BUG Rating:

B1 U1 G1

Dimensions



Features

- Covers footprint of most traditional wallpacks
- Easy installation with hinged access, bubble level and multiple conduit entries
- Tight-lock gasket keeps elements out
- 100,000-hour LED lifespan
- 5-Year warranty

Ordering Matrix

Family	Cutoff	Watts	Color Temp	Finish	Photocell	Bi-Level
SLIM						
	= Standard **C** = Cutoff **FC** = Full Cutoff	**62** = 62W **57** = 57W **37** = 37W	= 5000K (Cool) **Y** = 3000K (Warm) **N** = 4000K (Neutral)	= Bronze **W** = White	= No Photocell **/PC** = 120V Button **/PC2** = 277V Button **/PCS** = 120V Swivel **/PCS2** = 277V Swivel	= No Bi-Level **/BL** = Bi-Level

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Model # SLIM37N(All Fixture Colors)

Manufacturer: RAB Lighting
Brand: RAB Lighting
Technical Requirements Version: 2
Date Qualified: 10/24/2013
Product ID: P00001722

Categorization

Main: Outdoor Luminaires
General Application: Low Output
Primary Use: Outdoor Full-Cutoff Wall-Mounted Area Luminaires

Classification: Standard
Is Parent Product: Yes
DLC Family Code: AAAGQR
Dimming Status: NotYetVerified
Listing Status: Listed

Tested Data | Reported Data | Zonal Lumens | Family Data

Light Output: 2578 lm
Wattage: 37.6 W
Efficacy: 68.8 lm/W
Power Factor: 0.954
CCT: 3620 K
CRI: 82
Total Harmonic Distortion: 7.6 %

VANLED20

Low-profile vandal-resistant fixture covers the footprint of most traditional canopy lights. Available in flat or drop lens.

Color: Bronze

Weight: 12.0 lbs

Project:	Type:
Ridgewood	ECM HN99 & HN100
Prepared By:	**Date:**
Carrie Kaltwasser	1.5.17

Driver Info		LED Info	
Type:	Constant Current	Watts:	20W
120V:	0.30A	Color Temp:	5000K
208V:	0.20A	Color Accuracy:	74 CRI
240V:	0.17A	L70 Lifespan:	100000
277V:	0.15A	Lumens:	2,352
Input Watts:	22W	Efficacy:	108 LPW
Efficiency:	92%		

Technical Specifications

Listings

UL Listing:

Suitable for wet locations.

IESNA LM-79 & LM-80 Testing:

RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80, and have received the Department of Energy "Lighting Facts" label.

DLC Listed:

This product is on the Design Lights Consortium (DLC) Qualified Products List and is eligible for rebates from DLC Member Utilities.
DLC Product Code: PZQ1Z223

Electrical

Driver:

Class 2, Constant Current, 100-277V, 50-60Hz, 500mA

THD:

6.1% at 120V, 10.1% at 277V

Construction

Maximum Ambient Temperature:

Suitable for use in 104°F (40°C) ambient temperatures

Cold Weather Starting:

The minimum starting temperature is -40°F (-40°C)

Housing:

Die-cast aluminum housing and lens frame with (4) 1/2" NPS side conduit entries and weatherproof rear wire plug and access plate

Mounting:

Ceiling mount to recessed junction with knockout template or directy to ceiling surface, utilizing side conduit entry points.

IP Rating:

Ingress Protection rating of IP66 for dust and water

Lens:

Vandal-resistant polycarbonate textured opaque for low glare drop lens

Reflector:

Semi-specular, vacuum-metalized polycarbonate

Gaskets:

High-temperature silicone gaskets

Finish:

Our environmentally friendly polyester powder coatings are formulated for high-durability and long-lasting color, and contain no VOC or toxic heavy metals.

Green Technology:

Mercury and UV free. RoHS compliant components. Polyester powder coat finish formulated without the use of VOC or toxic heavy metals.

LED Characteristics

LEDs:

Discreet LEDs on PCB board

Color Stability:

RAB LEDs exceed industry standards for chromatic stability.

Color Uniformity:

RAB's range of CCT (Correlated Color Temperature) follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2011.

Other

Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish. See our full warranty .

California Title 24:

See VANLED20/PCS, VANLED20/PCS2 or VANLED20MS for a 2013 California Title 24 compliant model.

Replacement:

The VANLED 20W replaces up to 70W Metal Halide.

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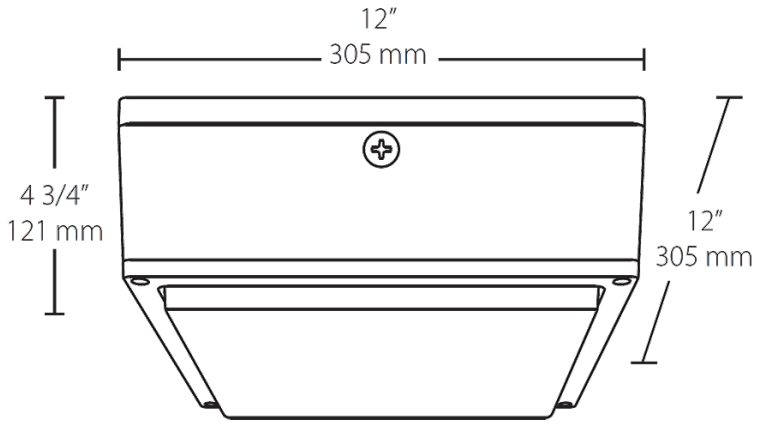
VANLED20

Dimensions



Features

- Fits the footprint of older canopy lights
- Vandal resistant and UV resistant lens
- Ultra-high efficiency
- Clean, contemporary, low-profile design
- Available with drop lens or flat lens
- IP66 rated, keeps dust, bugs and water out
- Photo and motion sensor options available

Ordering Matrix

Family	Watts	Color Temp	Lens	Finish	Voltage	Dimming
VANLED						
	10 = 10W **20** = 20W **40** = 40W **52** = 52W **65** = 65W **75** = 75W	**Blank** = 5000K (Cool) **Y** = 3000K (Warm) **N** = 4000K (Neutral)	**Blank** = Drop lens **F** = Flat lens	**Blank** = Bronze **W** = White	**Blank** = 120-277V **/480** = 480V (10W & 20W not available)	**Blank** = No Dimming **/D10** = Dimmable (10W & 20W not available)

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Model # VANLED20Y[All Fixture Colors]

Manufacturer: RAB Lighting
Brand: RAB Lighting
Technical Requirements Version: 2.1
Date Qualified: 06/01/2015
Product ID: PQ5Q3JZN

Categorization

Main: Outdoor Luminaires
General Application: Low Output
Primary Use: Fuel Pump Canopy Luminaires

Classification: Standard
Is Parent Product: Yes
DLC Family Code: CCCDZG
Dimming Status: NotDimmable
Listing Status: Listed

Tested Data | Zonal Lumens | Family Data

Light Output: 2255 lm
Wattage: 21.5 W
Efficacy: 104.9 lm/W
Power Factor: 0.924
CCT: 3087 K
CRI: 71
Total Harmonic Distortion: 20.1 %

WPLED2T150N

Ultra high output, high efficiency 150 Watt LED wallpacks. Patent Pending airflow technology ensures long LED and driver lifespan. 5 Year Warranty.

Color: Bronze Weight: 34.8 lbs

Project:	Type:
Prepared By:	Date:

Driver Info		LED Info	
Type:	Constant Current	Watts:	150W
120V:	1.31A	Color Temp:	4000K
208V:	0.80A	Color Accuracy:	71 CRI
240V:	0.69A	L70 Lifespan:	100000
277V:	0.60A	Lumens:	17213
Input Watts:	151W	Efficacy:	114 LPW
Efficiency:	99%		

Technical Specifications

Listings

UL Listing:

Suitable for wet locations.

DLC Listed:

This product is on the Design Lights Consortium (DLC) Qualified Products List and is eligible for rebates from DLC Member Utilities.
DLC Product Code: P0000174E

IESNA LM-79 & LM-80 Testing:

RAB LED luminaries have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80, and have been received the Department of Energy "Lighting Facts" label.

Dark Sky Approved:

The International Dark Sky Association has approved this product as a full cutoff, fully shielded luminaire.

LED Characteristics

Lifespan:

100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

LEDs:

Multi-chip, high-output, long-life LEDs

Color Consistency:

3-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color.

Color Stability:

LED color temperature is warrantied to shift no more than 200K in CCT over a 5 year period.

Color Uniformity:

RAB's range of CCT (Correlated Color Temperature) follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2017.

Construction

IES Classification:

The Type II distribution is ideal for wide walkways, on ramps and entrance roadways, bike paths and other long and narrow lighting applications. This type is meant for lighting larger areas and usually is located near the roadside. This type of lighting is commonly found on smaller side streets or jogging paths.

IP Rating:

Ingress Protection rating of IP66 for dust and water

Maximum Ambient Temperature:

Suitable for use in 40°C (104°F) ambient temperatures

Cold Weather Starting:

Minimum starting temperature is -40°C (-40°F)

Thermal Management:

Superior thermal management with external "Air-Flow" fins.

Housing:

Die-cast aluminum housing, lens frame and mounting arm

Mounting:

Heavy-duty mounting arm with "O" ring seal & stainless steel screws

Reflector:

Specular vacuum-metallized polycarbonate

Gaskets:

High-temperature silicone gaskets

Finish:

Formulated for high-durability and long lasting color.

Green Technology:

Mercury and UV free. RoHS compliant components. Polyester powder coat finish formulated without the use of VOC or toxic heavy metals.

For use on LEED Buildings:

IDA Dark Sky Approval means that this fixture can be used to achieve LEED Credits for Light Pollution Reduction.

Electrical

Drivers:

Two Drivers, Constant Current, Class 2, 2000mA, 100-277V, 50-60Hz, Power Factor 99%

THD:

5.9% at 120V, 11.2% at 277V

Other

Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish.

Patents:

The design of WPLED150 is protected by patents pending in US, Canada, China, Taiwan and Mexico.

Buy American Act Compliance:

RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

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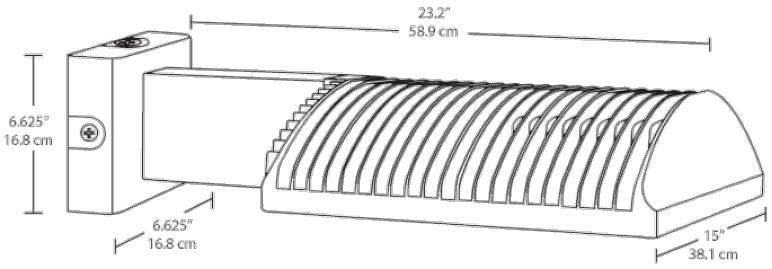
Technical Specifications (continued)

Optical

BUG Rating:

B2 U0 G2

Dimensions



Features

- High output, high efficiency LED
- Maintains 70% of initial lumens at 100,000 hours
- Weatherproof high temperature silicone gaskets
- Superior heat sinking with die cast aluminum housing and external fins
- 100 up to 277 Volts
- 5-year warranty

Ordering Matrix

Family	Distribution	Wattage	Color Temp	Mount	Finish	Photocell	Dimming	Sensor	Bi-Level
WPLED									
	2T = Type II **3T** = Type III **4T** = Type IV	**150** = 150W	**Blank** = 5000K (Cool) **Y** = 3000K (Warm) **N** = 4000K (Neutral)	**Blank** = Standard **FX** = Flat Wall	**Blank** = Bronze **W** = White	**Blank** = No Photocell **/PC** = 120V Button **/PC2** = 277 Button **/PCS** = 120V Swivel **/PCS2** = 277V Swivel **/PCT** = 120-277V Twistlock	**Blank** = No Dimming **/D10** = Dimmable	**/WS4** = Multi-Level Motion Sensor (Only available for 120-277V with /D10 for 150W)	**Blank** = No Bi-Level **/BL** = Bi-Level

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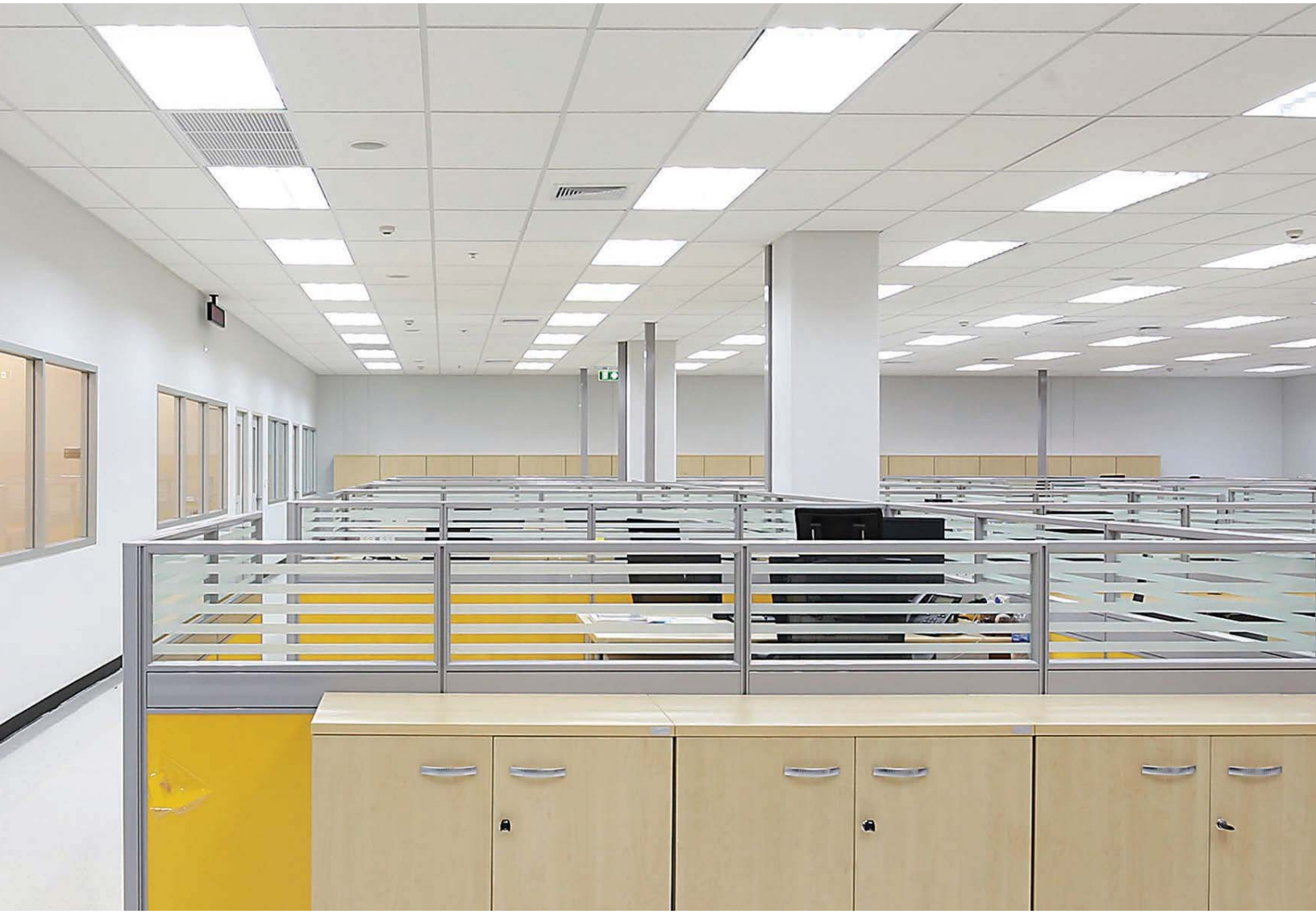
Revolution Lighting



Specification Sheet:

Uni-Fit G2 T5 LED Tubes

Indoor

177 Broad Street, 12th Floor, Stamford, CT 06901 T – 203 504 1111 rvlti.com

THE POWER TO OUTPERFORM

Specification Sheet: Uni-Fit G2 T5 LED Tubes

Retrofitting Is Easy with Our Energy Efficient Led Tubes

Our lightweight, shatterproof, all-plastic T5 Uni-Fit LED tubes can reduce your lighting energy use by as much as 40% compared to fluorescent lights and provide a superior quality of light.

Our plug-n-play tubes are ballast ready for easy installation without rewiring and are backed with our industry-leading 70,000 hour lamp life and 10-year warranty.

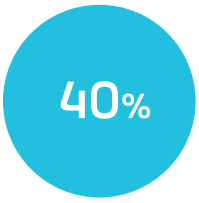
APPLICATIONS

- Offices & Commercial Buildings
- Retail Settings
- Hotels
- Schools
- Hospitals
- Warehouses
- Assisted Living Facilities
- Food Processing Centers
- Parking Garages
- Recreation Centers

ILLUMINATION ANGLE

Revolution Lighting Light Distribution

CAN DECREASE ENERGY USAGE BY



vs. Similar Fluorescent Lamps

WARRANTY

Our Industry-Leading 10-Year Limited Warranty Guarantees Unsurpassed Quality

PRODUCT BENEFITS

OPERATIONAL

- 3X greater lamp life than fluorescent, supported by industry-leading 10-year warranty
- 70,000-hour lamp life reduces long-term maintenance costs
- Instant on, no warm-up time

SAFETY

- No glass
- Negligible light depreciation over time
- Superior light output

SUSTAINABILITY

- Lack of UV or IR minimizes concerns with fading or discoloration
- Mercury-free, allowing for non-hazardous disposal
- 100% recyclable

ORDER LOGIC (Ex. UF2-46-27-F-HO-35)

Product Description		Length (in.)		Bare Lamp Wattage		Lens		Output		CCT (K Temp)
UF2 = Uni-Fit, G2 (Ballast-Ready)	-	46 = 45.25 in.	-	27 14	-	F = Frosted	-	HO = High Output HE = High Efficiency	-	30 = 3000K 35 = 3500K 40 = 4000K 50 = 5000K

Revolution Lighting Technologies, Inc.
177 Broad Street · 12th Floor · Stamford, CT 06901
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Specifications subject to change without notice.

For more information, visit **rvlti.com** or call **763-424-3702.**

Specification Sheet: Uni-Fit G2 T5 LED Tubes

TECHNICAL DATA (Subject to change.)*

Catalog No.	Product SKU No.	Rated Wattage	Lens	Base	Input Voltage	Color Temp (K)	Rated Lumens	Rated Efficacy	CRI	Illumination Angle	Rated Life (Hours)	Operating Temp. (°F)
G2 Uni-Fit 27W T5 HO Tube												
UF2-46-27-F-HO-30	204321-210	31.7	Frosted	G5	T5 Ballast	3000	3,354	106	84	310	70,000	-4 to 122
UF2-46-27-F-HO-35	204321-211	31.7	Frosted	G5	T5 Ballast	3500	3,419	108	84	310	70,000	-4 to 122
UF2-46-27-F-HO-40	204321-212	31.7	Frosted	G5	T5 Ballast	4000	3,485	110	84	310	70,000	-4 to 122
UF2-46-27-F-HO-50	204321-213	31.7	Frosted	G5	T5 Ballast	5000	3,615	114	83	310	70,000	-4 to 122
G2 Uni-Fit 14W T5 HE Tube												
UF2-46-14-F-HE-30	204320-210	16.1	Frosted	G5	T5 Ballast	3000	1,797	112	84	310	70,000	-4 to 122
UF2-46-14-F-HE-35	204320-211	16.2	Frosted	G5	T5 Ballast	3500	1,832	113	84	310	70,000	-4 to 122
UF2-46-14-F-HE-40	204320-212	16.2	Frosted	G5	T5 Ballast	4000	1,868	115	84	310	70,000	-4 to 122
UF2-46-14-F-HE-50	204320-213	16.4	Frosted	G5	T5 Ballast	5000	1,938	119	84	310	70,000	-4 to 122

Product is DLC listed.

** NOTE: The above rated performance specs were obtained with standard T5 HO/HE ballasts having a ballast factor of 1.0. Ballast-performance information is provided for reference only. Actual performance will vary.*

SHIPPING DATA (Subject to change)

Catalog No.	Product SKU No.	Product Dimensions (in.)	Case Qty.	Case Weight (lb)	Case Dimensions (in.)	Pallet Case Qty.	Pallet Weight (lb)	Pallet Dimensions (in.)
G2 Uni-Fit 27W T5 HO Tube								
UF2-46-27-F-HO-30	204321-210	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
UF2-46-27-F-HO-35	204321-211	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
UF2-46-27-F-HO-40	204321-212	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
UF2-46-27-F-HO-50	204321-213	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
G2 Uni-Fit 14W T5 HE Tube								
UF2-46-14-F-HE-30	204320-210	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
UF2-46-14-F-HE-35	204320-211	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
UF2-46-14-F-HE-40	204320-212	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H
UF2-46-14-F-HE-50	204320-213	45.8L x 0.71 Dia.	25	10	48.23L x 6.34W x 6.77H	40	420	48L x 40W x 68H

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Revolution Lighting

Specification Sheet:

T8 SEP LED Nano Tubes

Indoor

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THE POWER TO OUTPERFORM

Specification Sheet: T8 SEP LED Nano Tubes

Retrofitting Is Easy with Our Energy Efficient Led Tubes

Revolution Lighting's latest and most advanced T8 single-end-power LED Nano-Tube outperforms its competition. Our exclusive LED tube lamp has been integrated with our cutting-edge "Nano" lens technology to achieve superior performance and light output with as little as 8 watts. While reducing lighting energy use by up to 65%, our LED Nano-Tubes continue to outperform, enhancing light output to deliver up to 162 lumens per watt.

Designed for installation into any new or existing fixture intended for similar fluorescent lamps, our LED Nano-Tubes are direct-wire, require no ballast, and will work with any non-shunted socket at 120VAC to 277VAC. Coupled with our industry-leading 10-year warranty, and 70,000-hour lamp life, the T8 SEP LED Nano-Tube surpasses its competition.

APPLICATIONS

- Offices & Commercial Buildings
- Retail Settings
- Hotels
- Schools
- Hospitals
- Warehouses
- Assisted Living Facilities
- Parking Garages
- Recreation Centers

ILLUMINATION ANGLE

Revolution Lighting Light Distribution

CAN DECREASE ENERGY USAGE BY

vs. Similar Fluorescent Lamps

WARRANTY

Our Industry-Leading 10-Year Limited Warranty Guarantees Unsurpassed Quality

PRODUCT BENEFITS

OPERATIONAL

- Very high efficacies up to 162 lm/W
- 3X greater lamp life than fluorescent, supported by industry-leading 10-year warranty
- 70,000 hour lamp life and eliminated ballast reduce long-term maintenance costs
- Instant on, no warm-up time

SAFETY

- No glass
- Advanced Nano Technology PC tube
- Negligible light depreciation over time
- Superior light output

SUSTAINABILITY

- Lack of UV or IR minimizes concerns with fading or discoloration
- Mercury-free, allowing for non-hazardous disposal
- 100% recyclable

ORDER LOGIC (Ex. SEPG4-48-15-N-35)

Product Description		Length (in.)		Bare Lamp Wattage		Lens		CCT (K Temp)
SEPG4 = Single-End-Power Gen. 4	–	24 = 2 ft	–	8	–	N = Nano	–	30 = 3000K 35 = 3500K 40 = 4000K 50 = 5000K
SEPG4 = Single-End-Power Gen. 4	–	48 = 4 ft	–	15				
SEPG4 = Single-End-Power Gen. 4		48 = 4 ft	–	10.5		N = Nano		35 = 3500K 40 = 4000K 50 = 5000K

Note: All current order configurations listed below.

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Specification Sheet: T8 SEP LED Nano Tubes

TECHNICAL DATA (Subject to change)

Catalog No.	Product SKU No.	Rated Wattage	Lens	Base	Input Voltage (VAC)	Color Temp (K)	Rated Lumens	Rated Efficacy	CRI	Illumination Angle	Rated Life (Hours)	Operating Temp. (°F)
2-foot 8W G4 Single-End-Power LED Tube												
SEPG4-24-8-N-30	202000-411	8	Nano	G13	120-277	3000	1,100	137.5	83	312	>70,000	-4 to 122
SEPG4-24-8-N-35	202000-412	8	Nano	G13	120-277	3500	1,100	138	83	312	>70,000	-4 to 122
SEPG4-24-8-N-40	202000-413	8	Nano	G13	120-277	4000	1,100	138	83	312	>70,000	-4 to 122
SEPG4-24-8-N-50	202000-415	8	Nano	G13	120-277	5000	1,100	138	83	312	>70,000	-4 to 122
4-foot 10.5W G4 Single-End-Power LED Tube												
SEPG4-48-10.5-N-35	204001-432	10.5	Nano	G13	120-277	3500	1,700	162	83	312	>70,000	-4 to 122
SEPG4-48-10.5-N-40	204001-433	10.5	Nano	G13	120-277	4000	1,700	162	83	312	>70,000	-4 to 122
SEPG4-48-10.5-N-50	204001-435	10.5	Nano	G13	120-277	5000	1,700	162	83	312	>70,000	-4 to 122
4-foot 15W G4 Single-End-Power LED Tube												
SEPG4-48-15-N-30	204002-411	15	Nano	G13	120-277	3000	2,100	140	83	312	>70,000	-4 to 122
SEPG4-48-15-N-35	204002-412	15	Nano	G13	120-277	3500	2,100	140	83	312	>70,000	-4 to 122
SEPG4-48-15-N-40	204002-413	15	Nano	G13	120-277	4000	2,100	140	83	312	>70,000	-4 to 122
SEPG4-48-15-N-50	204002-415	15	Nano	G13	120-277	5000	2,100	140	83	312	>70,000	-4 to 122

Product is DLC listed.

SHIPPING DATA (Subject to change)

Catalog No.	Product SKU No.	Product Dimensions (in.)	Product Weight (lb)	Case Qty.	Case Weight (lb)	Case Dimensions (in.)	Pallet Case Qty.	Pallet Weight (lb)	Pallet Dimensions (in.)
2-foot 8W G4 Single-End-Power LED Tube									
SEPG4-24-8-N-30	202000-411	24L x 1 Dia.	0.24	25	10	26L x 8W x 8H	80	810	48L x 44W x 70H
SEPG4-24-8-N-35	202000-412	24L x 1 Dia.	0.24	25	10	26L x 8W x 8H	80	810	48L x 44W x 70H
SEPG4-24-8-N-40	202000-413	24L x 1 Dia.	0.24	25	10	26L x 8W x 8H	80	810	48L x 44W x 70H
SEPG4-24-8-N-50	202000-415	24L x 1 Dia.	0.24	25	10	26L x 8W x 8H	80	810	48L x 44W x 70H
4-foot 10.5W G4 Single-End-Power LED Tube									
SEPG4-48-10.5-N-35	204001-432	48L x 1 Dia.	0.30	25	12.5	50L x 9W x 9H	32	435	48L x 40W x 78H
SEPG4-48-10.5-N-40	204001-433	48L x 1 Dia.	0.30	25	12.5	50L x 9W x 9H	32	435	48L x 40W x 78H
SEPG4-48-10.5-N-50	204001-435	48L x 1 Dia.	0.30	25	12.5	50L x 9W x 9H	32	435	48L x 40W x 78H
4-foot 15W G4 Single-End-Power LED Tube									
SEPG4-48-15-N-30	204002-411	48L x 1 Dia.	0.44	25	18	50L x 8W x 8H	40	745	48L x 40W x 70H
SEPG4-48-15-N-35	204002-412	48L x 1 Dia.	0.44	25	18	50L x 8W x 8H	40	745	48L x 40W x 70H
SEPG4-48-15-N-40	204002-413	48L x 1 Dia.	0.44	25	18	50L x 8W x 8H	40	745	48L x 40W x 70H
SEPG4-48-15-N-50	204002-415	48L x 1 Dia.	0.44	25	18	50L x 8W x 8H	40	745	48L x 40W x 70H

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E-SAVER OPAL-R™ Series

THE E-SAVER-80R/81R TRANSFORMERS ARE OPTIMIZED FOR RETROFIT PROJECTS DELIVERING ON AVERAGE 80% ENERGY SAVINGS WHEN REPLACING OLDER UNITS

APPLICATION

E-SAVER™ - 80R and E-SAVER™ - 81R are ultra-efficient dry-type transformers that have been optimized to maximize energy savings and provide the fastest payback in the most widespread retrofit applications.

For more than a decade, Powersmiths has actively measured low-voltage transformer load profiles and losses for the thousands of transformers it has retrofitted in a wide variety of applications from K-12 schools to hospitals and college campuses, from military bases to courthouses, from mission critical high tech data centers to general commercial office buildings. In these applications, Powersmiths has found the most common profile to be a lightly loaded transformer that feeds predominately electronic equipment. Optimized specifically for this profile, E-SAVER-80R and 81R have shown to deliver an average of 80% reduction in losses per project when replacing older existing transformers.

For transformers feeding dedicated equipment like fans, motors and elevators, or heavy harmonic rich loads, see the rest of the E-Saver family as well as Powersmiths T1000.

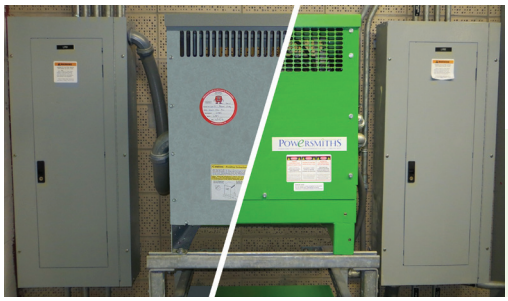
OPAL™ - OPTIMIZED DESIGNS FOR RETROFITS

There is more to a transformer retrofit than simply matching the capacity and input/output voltages with a typical transformer from the distributor's warehouse. A transformer has much more impact in an electrical system than just efficiency, since its electrical characteristics affect fault and arc flash levels as well as inrush. In a retrofit, there are other important considerations including site conditions like footprint and internal terminal layout.

To address these needs, Powersmiths has developed a transformer design best practice called OPAL™ - Optimized Performance for the Application Load. OPAL ensures compatibility by considering the system as a whole, including goals like managing impedance, arc flash, fault level, inrush, harmonics, and more. OPAL is possible thanks to the tight feedback loop between design, onsite manufacturing, and extensive ongoing real world operating performance verification. The result is the most savings per dollar spent. Our flexible design and manufacturing process enables us to deliver solutions for the wide variety of site conditions and transformer manufacturers including footprint and internal terminal layouts.

DOE 2016 IDENTIFIES BILLIONS IN SAVINGS BEYOND NEW LEGAL MINIMUM

Most manufacturers have designed their low-voltage transformers to just meet the new U.S. Dept. of Energy law (DOE 2016), setting minimum efficiency at a single required 35% load point, under an ideal sine wave factory test profile, sacrificing performance elsewhere. The DOE quantifies savings for going beyond DOE 2016 in billions of dollars. Furthermore, the DOE states that lifecycle savings can be maximized by optimizing for real-world loading. Powersmiths OPAL™ enables customers to access these savings – backed by real-world performance verification.



E-Saver OPAL-R™ Retrofits deliver maximum energy savings and follow best practices to measure & verify lifecycle savings, and ensure hassle-free transformer replacements.

RETROFITS REQUIRE A BEST PRACTICE

To replace existing transformers cost effectively, Powersmiths uses a multi-step best practice covering the entire project cycle, from vetted project savings calculations, to comprehensive site audits and tagging, individualized product selection baseline and post installation field measurement of load profile, losses and efficiency following IPMVP protocols, and performance reports, all under the supervision of professional engineers.

GUARANTEED PERFORMANCE OVER 25 YEARS

In a world filled with small print disclaimers and limited DOE compliance testing, you can count on Powersmiths performance because we guarantee that every transformer we manufacture meets our published technical data, and furthermore, that this performance is met over the full term of the 25-year pro-rated warranty. Being able to trust that savings are both real and long-term is part of why organizations choose Powersmiths.

K-RATING IS A MODERN REQUIREMENT

Many general purpose transformers are purchased and installed since they have the lowest first cost, however, they carry a UL label on the basis of feeding only linear load. Since most connected loads today are electronic with nonlinear profiles, a low-voltage transformer needs to be K-rated in order to have a valid UL listing for most applications today. E-Savers are appropriately K-rated.

EXPANDED KVA SELECTION ENABLES RIGHT-SIZING

Powersmiths enables right-sizing of electrical infrastructure by offering a much broader selection of transformer kVA sizes. The capital cost, operating cost and footprint reductions can be dramatic - on the order of 30-50%, through smaller transformers, breakers, conductors, and distribution panels.

ENVIRONMENTAL/GREEN BUILDING/LEED®/NET ZERO

By going meaningfully beyond the DOE 2016 baseline efficiency, the E-Saver™ contributes to green building, LEED®, Net Zero and carbon footprint reduction goals. Additional benefits include our ISO14001 certified manufacturing, integrated metering and ability to integrate with the Powersmiths WOW™ Sustainability Management Platform.

CERTIFICATIONS & TESTING

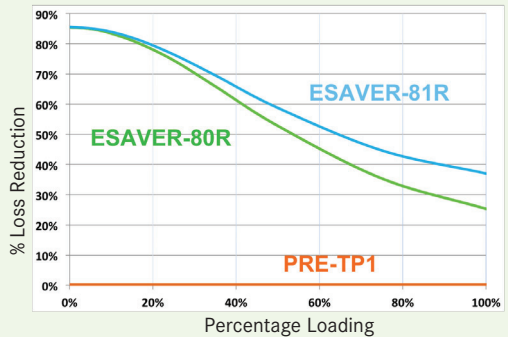
Powersmiths certifications include ISO9001 (Quality), ISO14001 (Environment) ISO17025 (Efficiency Test Lab), UL and CSA. Powersmiths has a production-integrated nonlinear load test program that enables efficiency verification under real-world conditions, as well as Certified Test Lab Profile Test Reports.

METERING & ARC FLASH OPTIONS

Integrated metering can provide information about capacity utilization, load profiles, power quality and energy use. The lockable hinged door option as well as our patented 360º Rotatable IR Port™ option enable quick and safe access to internal transformer connections, and reduces arc flash risk.

Powersmiths offers also transformers with Integrated Power Distribution, see the Energy Station TX brochure.

E-SAVER OPAL-R™ Loss Reduction Curves



KEY FEATURES

- Optimized for light, nonlinear loads found in most applications K-rated as required by UL to feed modern electronic equipment
- Retrofit Best Practice ensures a smooth retrofit with verified savings
- Significant savings beyond DOE 2016 legislation
- Electrical system consideration: impedance, inrush, fault & arc flash levels
- Available with a wide range of safety & performance features like integrated hinged doors, 360º Rotatable IR Port™, and Cyberhawk™ Metering and Logging
- Manufactured in a certified ISO 9001, ISO 14001 and ISO 17025 facility for quality, low environmental impact, and transformer efficiency testing

[1] U.S. Dept. of Energy 10 CFR Part 431, [Docket No. EERE–2010–BT–STD–0048] Energy Conservation Program: Energy Conservation Standards for Distribution Transformers, Final Rule April 18, 2013.

TECHNICAL SPECIFICATIONS

The E-Saver™-80R and 81R are ultra-efficient low-voltage dry-type transformers that meaningfully exceed the U.S. Dept. of Energy's new minimum efficiency law, commonly referred to as DOE 2016. All E-Saver transformers carry a UL Listing and CSA Approval, with application appropriate K-factor.

The aluminum wound E-Saver-80R and the copper wound E-Saver-81R are both K-factor listed per UL 1561 and are K-7 rated per C57.110. Both models are compatible with electronic equipment all the way up to full load.

E-Savers have a common-core (3-phase models), 10kV BIL, 200% rated neutral, are 60Hz rated (std), built to NEMA ST-20, UL1561, IEEE C57.110 and other applicable ANSI and IEEE standards. Both primary and secondary terminals and voltage taps (typically six 2.5%) are all front-accessible. E-Savers have a 220°C class insulation system that is NOMEX-based with an Epoxy Co-polymer impregnant with technical performance characteristics that embed lower environmental impact, long term reliability and long life expectancy. E-Savers carry OSHPD and IBC Seismic Certification. The seismic bracing option provides a higher 2.28g certification. All E-Saver models come standard in a Type 2 ventilated drip-proof indoor enclosure made of heavy gauge steel finished with epoxy powder coating for durability and low environmental impact, and are UL Listed for 2" rear clearance - a significant improvement over the typical industry 6" limit. A wide variety of enclosures and options are available.

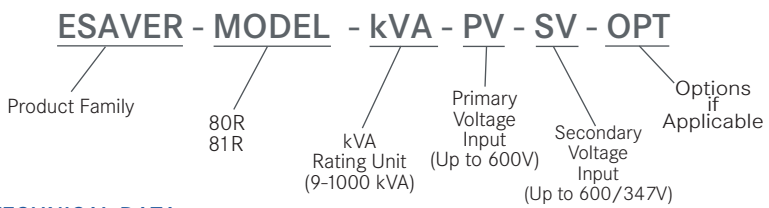
Low Noise: Keeping audible noise at a minimum is key. While the NEMA ST-20 standard sets levels referenced by industry only a type test, not a production test, is required – so transformers on actual projects may be noisy. Powersmiths builds 3dB quieter than NEMA standard values, and furthermore every unit is tested to ensure quiet operation. For very sensitive environments an additional 2dB lower noise option is available.

Management of Impedance, Inrush, Fault Level, Arc Flash: Powersmiths OPAL™ design best practice includes addressing key transformer attributes like impedance, inrush, fault level, arc flash, to ensure smooth integration into an electrical system, avoiding the negative impacts often associated with high efficiency transformers. See individual technical data sheets for comprehensive values for all parameters.

Impedance: For both the E-Saver-80R and E-Saver-81R, impedance is kept at or above 4.0% in order to manage downstream fault current and arc flash levels, and maintain compatibility with equipment interrupting capacity (kAIC) ratings. Higher impedance is available to meet specific project needs.

Inrush: Inrush currents are managed in order to avoid nuisance tripping of the primary breaker and to enable design engineers to use standard 125% rated primary protection, thereby avoiding expensive design changes that otherwise may be needed. Very Low Inrush designs are available as specific projects may require, for example some datacenter and medical applications.

ORDERING INFORMATION



TECHNICAL DATA

kVA	Audible Noise	80R, 81R Model Weight Range (lbs)	Standard Case Size (in)	Alternate Smaller Case Size (in)
15	42 dB	230-300	17.5W x 17D x 27.5H	17.5W x 14.5D x 25H
20	42 dB	260-340	25.5W x 18D x 30H	23W x 15.5D x 27.5H
25	42 dB	300-380	25.5W x 18D x 30H	23W x 15.5D x 27.5H
30	42 dB	340-420	25.5W x 18D x 30H	23W x 15.5D x 27.5H
45	42 dB	400-540	25.5W x 18D x 30H	25.5W x 16D x 29H
50	42 dB	450-600	25.5W x 18D x 30H	No Alternate
63	47 dB	500-650	31.5W x 21.5D x 40H	26.5H x 20D x 33H
75	47 dB	610-700	31.5W x 21.5D x 40H	26.5H x 20D x 33H
100	47 dB	675-900	31.5W x 21.5D x 40H	30.5H x 20D x 35H
112	47 dB	770-990	31.5W x 21.5D x 40H	30.5H x 20D x 35H
125	47 dB	875-1120	37.5W x 26.5D x 48H	33W x 23D x 38H
150	47 dB	1010-1230	37.5W x 26.5D x 48H	33W x 23D x 38H
175	52 dB	1100-1360	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
200	52 dB	1175-1450	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
225	52 dB	1295-1600	37.5W x 31.5D x 52H	34.5W x 26.5D x 42H
250	52 dB	1400-1800	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
300	52 dB	1575-1960	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
400	57 dB	2025-2450	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
450	57 dB	2200-2600	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
500	57 dB	2475-2900	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
600	59 dB	2725-3600	64W x 47D x 67H	51.5W x 38D x 61H
750	61 dB	3200-4300	64W x 47D x 67H	Contact Factory
850	61 dB	3600-5000	64W x 53D x 67H	Contact Factory
1000	61 dB	4200-6000	64W x 53D x 67H	Contact Factory

AVAILABLE OPTIONS

Metering: Express Logger™, SMART™ or Cyberhawk TX™ (see product cut sheets for details)
CC: Core & Coils available for OEM Integration
3R: Type 3R, sprinkler proof/outdoor ventilated enclosure
OSEC: Enclosure for outdoor public areas
SS: Painted stainless steel enclosure
NVI: Non-ventilated indoor enclosure
IRP: 360º Rotatable IR Port™
HD: Hinged Door
F50: 50 Hz design
1S: Single electrostatic shield
2S: Dual electrostatic shields
3S: Triple electrostatic shields
SPD: (120/208 V OR 277/480V)
- **PRO80:** 80kA, 7 mode, Filter
- **PRO120:** 120kA, 7 mode, Filter
- **PRO200:** 200kA, 7 mode, Filter
- **PRO240:** 240kA, 7 mode Filter
- **PROXX:** Where XX is custom ID

LKS: Lug kit, screw-type
LKC: Lug kit, compression type
VLI: Very Low Inrush
IMP: Custom Impedance
COL: Custom color
TS: Thermal sensors at 170°C and 200°C
RTR: Routine Test Report
NLT: Nonlinear Load Test with Certificate
2016TR: DOE 2016 Test Report
CTL: ISO 17025 Certified Test Lab, load profile test
SE: Sensitive environment, extra low noise
SB: Certified Seismic bracing for 2.28g (for Certificate details contact Powersmiths)
WM: Wall-mount kit up to 75kVA is available (sold separately)

NOTE: The above data applies to the standard configuration of each kVA. Selection of some options may change enclosure size and/or transformer weight. Some options may be mutually exclusive. Consult factory for detailed product data sheet for these and other configurations. Efficiencies tested according to U.S. Dept. of Energy's 10 CFR Part 431, a linear load test at 35% of nameplate capacity. Refer to technical data sheet for comprehensive information for each specific model, kVA, and option selected.

As design optimization is continuous, technical data is updated over time. Please check with Powersmiths for latest revision.

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POWERSMITHS

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WWW.POWERSMITHS.COM

807-000431-156-A 02

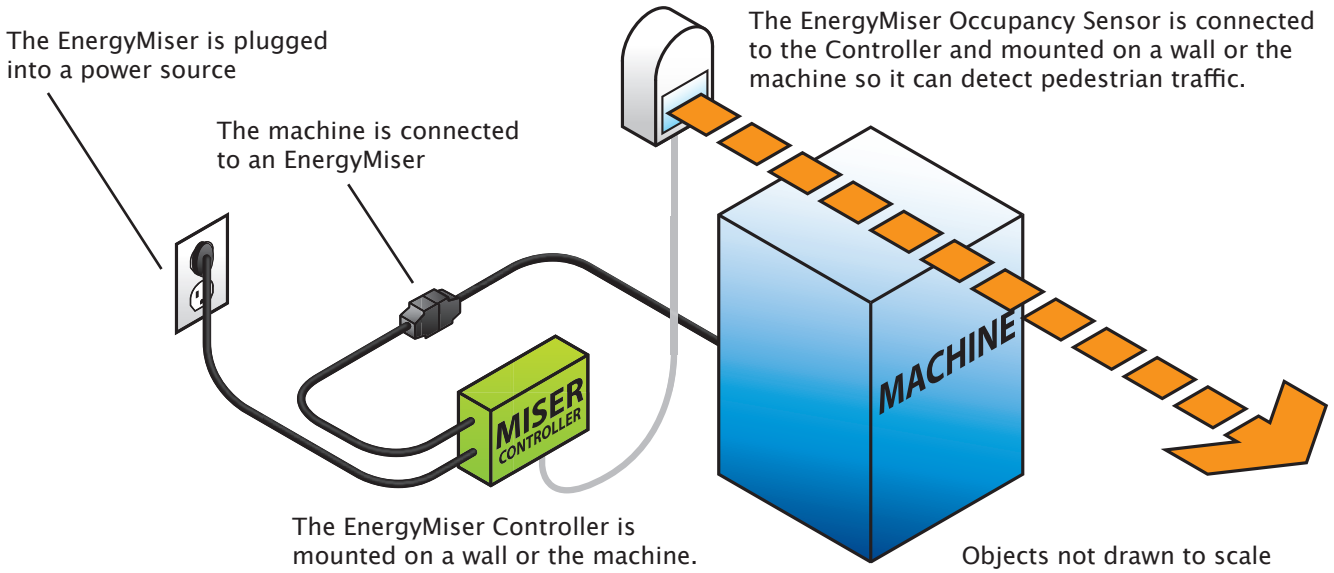
EnergyMisers

EnergyMiser® Products are easy to install devices designed to lower the energy consumption of vending machines, commercial coolers, and other "always on" machines and appliances. No other technology can compete with its price and ease of installation for the immediate energy savings that can be achieved.

- Win and retain accounts by offering energy-efficient technology
- Save clients up to $150 per machine, per year
- Typical return on investment in 12 months
- Easy retrofit field installation
- Reduction in machine energy use an average of 35-45%
- Reduced machine maintenance and longer machine lifespans
- Environmental benefits such as reducing pollution and natural resource use

How EnergyMisers Work

External EnergyMisers use a controller and a machine mounted sensor to monitor room occupancy and temperature. If 15 minutes pass without any pedestrian traffic, the EnergyMiser will power down the machine. The machine is powered back up when people return and at regular intervals to to keep the product cold. External controllers are best suited for low traffic areas.



Internal EnergyMisers use sales based intelligence to power down the cooling system while leaving lighting and controller electronics on. While the cooling system is powered down, the internal EnergyMiser monitors the room's temperature and automatically re-powers the cooling system at regular intervals to keep the product cold. Internal controllers are best suited for high traffic areas.

Who Uses EnergyMisers

Several large retailers such as Wal-Mart and Kroger have installed EnergyMiser Products at their locations. Educational facilities along with the US Government have purchased EnergyMisers through GSA. Also, many utilities offer rebates on the purchase of EnergyMiser products and several have provided customers with EnergyMiser Products at no cost through Turnkey Programs.

USA Technologies 100 Deerfield Lane, Suite 140, Malvern, PA 19355 • 800.633.0340 • www.usatech.com

EnergyMiser Products

VendingMiser®- for cold drink vending machines
VM150 - Indoor Wall Mount Controller with Occupancy Sensor
VM151 - Indoor Wall Mount Controller with 10' Repeater Cable
VM160 - Outdoor Wall Mount Controller with Occupancy Sensor and Weather-proof Enclosure
VM161 - Outdoor Wall Mount Controller with 10' Repeater Cable and Weather-proof Enclosure
VM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
VM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
VM180 - Outdoor Controller with EZ Mount Z-Bracket, Occupancy Sensor, and Weatherproof Enclosure
VM181 - Outdoor Controller with EZ Mount L-Bracket, 10' Repeater Cable and Weatherproof Enclosure
VM2iQ - Internal VendingMiser

CoolerMiser™- for commercial glass-front coolers
CM150 - Indoor Wall Mount Controller with Occupancy Sensor
CM151 - Indoor Wall Mount Controller with 10' Repeater Cable
CM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
CM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
CM2iQ - Internal CoolerMiser

SnackMiser®- for snack vending machines
SM150 - Indoor Wall Mount Controller with Occupancy Sensor
SM151 - Indoor Wall Mount Controller with 10' Repeater Cable
SM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
SM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable

PlugMiser™- for most major electrical equipment
PM150 - Indoor Wall Mount Controller with Occupancy Sensor
PM151 - Indoor Wall Mount Controller with 10' Repeater Cable
PM190 - Indoor Controller with Leg Mount and Occupancy Sensor

VendingMiser VM150

CoolerMiser CM150

SnackMiser SM150

PlugMiser PM150

Visit www.energymisers.com for more information.

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Premium Efficient Motors

Product Overview and Options

Nidec Motor Corporation offers an extensive line of industrial and commercial U.S. MOTORS® brand high efficiency electric motors that meet or exceed NEMA Premium®† standards, ensuring your facility complies with local electrical codes and safety regulations.

Industrial Cast Iron Motors for Hostile, Severe Environments

- Hostile Duty Motors
- CORRO-DUTY® Motors
- 841 PLUS® Motors

Commercial Duty Motors Used In Office Buildings, Schools, and Other Federal Facilities

- Open Dripproof Motors
- UNIMOUNT® Motors

HVAC Motors for Air Moving and Conditioning Applications

- Cooling Tower Duty Motors
- Open Dripproof Motors
- UNIMOUNT® Motors

HOSTILE DUTY™ Motors

- Totally Enclosed Fan Cooled
- Three Phase, 60 Hz
- 1.00 and 1.15 Service Factor
- 1–350 HP
- 2, 4, 6, and 8 Poles
- 143–286 Frame
- Cast Iron Frame and Brackets
- Ball and Roller Bearing Options

CORRO-DUTY® Motors

- Totally Enclosed Fan Cooled
- Three Phase, 60 Hz
- 1–200 HP
- 2, 4, and 6 Poles
- 143–447 Frame
- All Cast Iron Construction

841 PLUS® Motors

- Totally Enclosed Fan Cooled
- Three Phase, 60 Hz
- 1.0 or 1.15 Service Factor
- 1–400 HP
- 2, 4, 6, and 8 Poles
- 143–447 Frame
- VBBX®† Bearing Isolators by Inpro/Seal
- Meets IEEE®† 841 GM7E-TA Specifications
- Five Year Warranty*
- Footed and C-Face Footless

Product Overview and Options *continued*

Open Dripproof Motors

- Three Phase, 60 Hz
- 1.0 and 1.15 Service Factor
- 1/4–400 HP
- 2, 4, 6, and 8 Poles
- 48–449 Frame
- Close Coupled Ratings Available

UNIMOUNT® Motors

- Totally Enclosed Fan Cooled
- Three Phase, 60 Hz
- 1.25 Service Factor
- 1/4–30 HP
- 2, 4, 6, and 8 Poles
- 50–286 Frame
- C-Face, Footed and Footless
- Removable Base 180 Frame and Above
- F2 Field Assembly
- Close Coupled Ratings Available

Hazardous Location Motors

- Totally Enclosed Fan Cooled
- Three Phase
- 1 to 200 HP
- 2, 4, and 6 Poles
- 143 to 447 Frame
- Single and Dual Label

Automotive Duty, U-frame Motors

- Totally Enclosed Fan Cooled
- Three Phase, 60 Hz
- 1/4–300 HP
- 2, 4, 6, and 8 Poles
- 56–5008 Frame
- Motors Available that Meet GM-7EQ, GM-7EH, Ford EM1 and Chrysler NPEM-105 specifications

Cooling Tower Motors

- Totally Enclosed Fan Cooled and Totally Enclosed Air Oven Options
- Three Phase, 60 Hz
- 2–100 HP
- 4, 6, 4/8 Poles
- 145–449 Frame
- Single Speed and Two Speed Options
- Motors Available that Meet Specifications for Baltimore Aircoil Company, Inc., Evapco, Inc., and SPX Cooling Technologies, Inc.

The Energy Independence and Security Act

On December 19, 2010, commercial and industrial motor manufacturers and importers will raise efficiencies to the NEMA Premium®† levels for all general purpose motors up to 600 volts, from 1 to 200 horsepower, in NEMA frame sizes. Additional categories of motors will be raised to energy efficient levels.

What does this mean for your business?

- The implementation of NEMA Premium®† and the elimination of the corresponding energy efficiency standards has removed models in both stock and configured categories.
- All customers, whether OEM, reseller or end-user need to comply.
- OEMs may require 3rd party certification of their equipment through UL® / CSA®.
- End-user will see first cost go up, but will benefit from life cycle reduction in energy costs.

We make the transition EASY

Nidec Motor Corporation's line of high performance commercial and industrial U.S. MOTORS® brand motors is designed to help industry reduce energy consumption and comply with EISA regulations. This line features upgraded open dripproof and totally enclosed motors that meet or exceed NEMA Premium®† requirements.

All high performance motors carry a nameplate including both 50 and 60 Hz operating data, a NEMA Premium®† trademark and European IE efficiency marks, providing a clear means for both users and OEM's to verify global regulatory compliance.

In addition to a full line of horizontal motors, the U.S. MOTORS® brand line of vertical motors are available at Premium efficiency levels to address customer requirements.

The NEMA Premium®† line also complies with recent Canadian and Mexican standards.

Want to learn more about motor efficiency and saving energy costs?

The online MotorPro® training tool features a new module on electric motor energy efficiency. Just visit www.usmotors.com/motorpro, and choose Module 3 for complete details on energy laws and efficiency — and on how you can reduce your energy usage and operating costs.

† All marks shown within this document are properties of their respective owners.
Note: For premium efficient vertical motor designs, visit www.usmotors.com

NIDEC MOTOR CORPORATION

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Nidec Motor Corporation trademarks followed by the ® symbol are registered with the U.S. Patent and Trademark Office.

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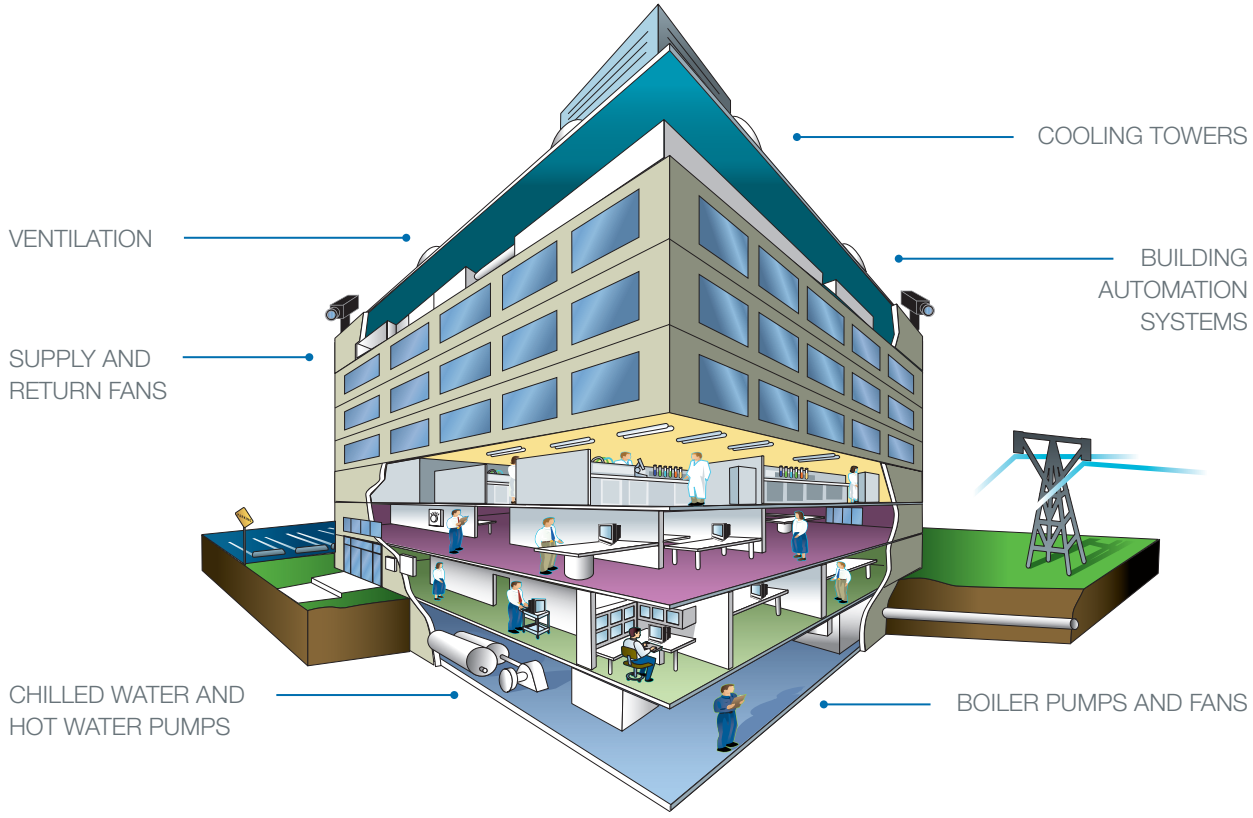
SmartVFD HVAC and BYPASS

Honeywell

The Smart Choice for Energy Savings.

Saving Energy the Smart Way

Buildings consume more than 70 percent of the electricity produced in North America — and roughly half of that is used to circulate air and water. Honeywell SmartVFD HVAC, BYPASS and COMPACT variable frequency drives maximize energy savings by modulating the speed of fans and pumps. VFDs achieve these savings by operating within a building's control system or independently through its internal PID capabilities. Additionally, Honeywell's VFDs are loaded with labor-saving features such as startup wizards, PC programming, and an intuitive graphical interface that allows for faster, more accurate commissioning and reliable maintenance over the life of the drive.



BACKED BY HONEYWELL

Already among the leading names in HVAC variable frequency drives, Honeywell is pleased to deliver the SmartVFD HVAC line — the third generation of Honeywell VFDs. Designed specifically for commercial applications and backed by more than a century of Honeywell's control expertise, you can count on Honeywell's SmartVFD HVAC and BYPASS to deliver long-term service and energy savings for your customer. You simply can't find a commercial building control name with a more proven record than Honeywell.

The Smart Choice for Efficient Investment

It's a common myth that any VFD can easily be applied in a commercial application, but many VFDs are not the right tool for the job. The Honeywell SmartVFD HVAC and BYPASS are designed specifically for commercial buildings to deliver the energy savings that building owners and facility managers need with 98 percent energy efficiency, minimal labor and a fast ROI.

SMARTVFD HVAC – SMART INSTALLATION, SMART COMMISSIONING AND SMART COMMUNICATION

The Honeywell SmartVFD HVAC meets UL and cUL standards which makes installation and commissioning easy for you and energy savings easy for your customers:

Easy Communication

- Start-up Wizards — Set the clock and tell the VFD whether you have a pump or a fan, enter nominal motor information, and you are up and running. PID and multi-pumps wizards are also built in.
- PC Software Wizards — Commissioning, programming and troubleshooting are all a snap with the PC Software Wizards.
- Graphic Interface — The easy-to-use keypad and interface deliver menu-driven programming and monitoring for fast, uniform commissioning. It's also easy for the building owner or manager to learn and use, helping to reduce service calls. Every parameter has a built-in help feature to provide assistance while programming.
- Built-In Communications — With BACnet®, N2 and Modbus built in, your customers will enjoy a lower total installed cost and reliable communications with the building management system.
- Built-In PLC — PC based tools eliminate the need for an expensive external controller.

Built-in Protection

- DC Choke for harmonic protection.
- Standard RFI Filter — Ensures that EMC/RFI requirements are met.
- Bypass Options — Meet specifications and system critical applications with a comprehensive bypass offering.

Smart Software

- Real-Time Clock — Battery included.
- Fire Mode to improve fire safety in the building.
- Motor Switch Ride-Through — Easy, fault-free maintenance.
- Hand-Off-Auto (HOA) control built into the keypad.
- Plenum rated for install flexibility.
- 100 KA Short Circuit Current Rating (SCCR) rated.

Smart Benefits with Easy Commissioning

Honeywell SmartVFD HVAC doesn't just work in the laboratory — it works in the field. From the variety of network protocols that make integration easy, to the guided Startup and PID wizards, the design and technology of SmartVFDs make them true HVAC drives. Intuitive menus assist with commissioning, programming, troubleshooting and overall operation.

COMMUNICATION STANDARD

Integrating Honeywell SmartVFD HVAC into a building management system is a breeze. There's no need for extra cards because it offers a wide range of communications protocols right out of the box, including:

- RS485 – BACnet®, Modbus and N2
- Ethernet – BACnet/IP and Modbus/TCP
- Available options – LonWorks® and DeviceNet

HIGH-RESOLUTION GRAPHIC DISPLAY

It's not just easy on the eyes, it's also easy to use. The menu driven display shows the minimum, maximum and actual values for all parameters and allows easy uploading and downloading of parameters, and has multiple help functions and the manual built-in. In addition, there is a Local/Remote button on the keypad for built in HOA control.

DETERMINE ROOT CAUSE OF FAULTS

With the SmartVFD HVAC, troubleshooting involves very little trouble. The built in, diagnostic screen provides a description for every fault, and the actual values and references are stored at the time of the fault for easy review and problem resolution.

MONITOR SYSTEM PERFORMANCE

The data needed to analyze usage and make adjustments for maximum energy savings is right at your fingertips. Actual electricity consumption in kWh can be monitored using the VFD PC Wizard, and can be conveniently displayed in bar graphs. At any time, the user can see the actual power consumption currently in use — a great tool for managing energy savings.

Smart Configurations

For system critical applications, you must be able to select a bypass that meets the requirements of the specification. The SmartVFD BYPASS is easy to specify, select, install and commission. The SmartVFD BYPASS is UL certified and is the perfect complement to the advanced capabilities of the SmartVFD family — a combination that is both simple and smart.

SMARTVFD BYPASS CONFIGURATIONS

Our five configurations make it easy for you to select the right bypass to complete your drive package. All bundles are available in NEMA 1, NEMA 12 and ventilated NEMA 3R HOA (HAND OFF AUTO).

SmartVFD Disconnect Only

- Adds a fused disconnect to the VFD.

SmartVFD 2-Contactor Bypass

Provides an economical means of bypassing the VFD.

- Freeze/Fire/Smoke Interlock

SmartVFD 3-Contactor Bypass

Commission, service or replace the VFD without affecting the operation of the motor.

- Fused Disconnect
- Freeze/Fire/Smoke Interlock
- VFD is isolated from power with motor running in BYPASS mode
- TEST position powers the VFD without sending power to the motor

SmartVFD 3-Contactor Bypass with Auto-Bypass

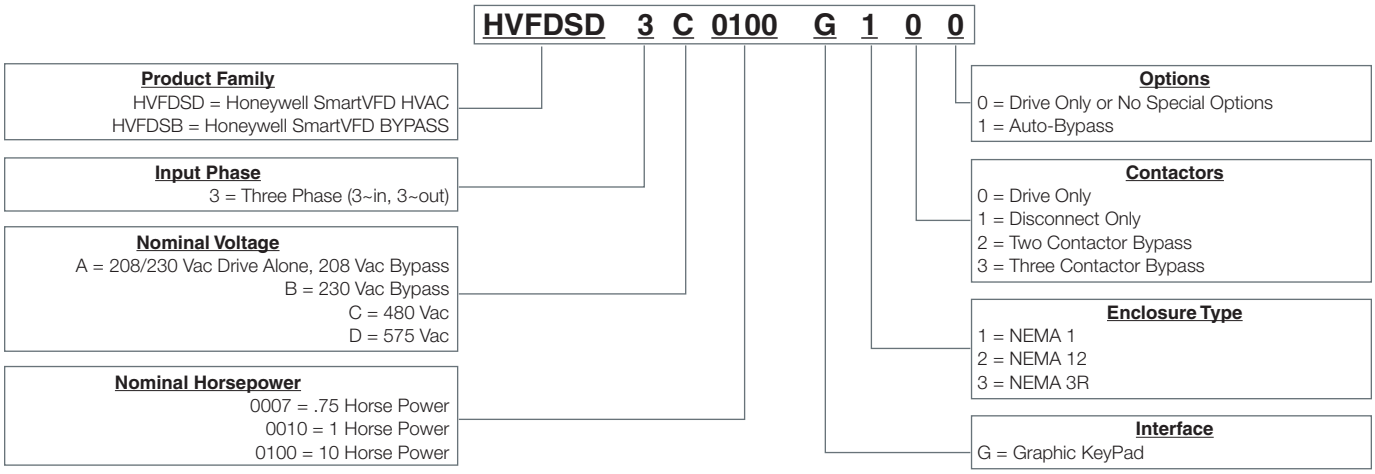
The package adds the control capabilities below to the standard three contactor bypass.

- Any VFD fault will automatically send the bypass to BYPASS mode
- A contact closure sends the bypass to BYPASS mode
- Dry contacts indicate when the bypass is in BYPASS mode, alerting the building management system

SLEEKER. SMALLER. SMARTER.

As the latest evolution of the Honeywell VFD line, the SmartVFD BYPASS is sleeker, smaller, lighter and less expensive.

Smart Selection



PICK THE RIGHT VFD FOR THE APPLICATION

- Drives are typically sized to match the horsepower rating of the motor, which will be accurate 95 percent of the time. But for the greatest accuracy, drives should be sized based upon the Full Load Amps or current draw of the motor. The VFD must have a slightly larger current rating maximum.
- The environment the drive will operate in is critical for selection. Honeywell offers NEMA 1, NEMA 12 (for dusty, dirtier environments) and NEMA 3R enclosures (for falling water or rain situations).
- Because of the complexity of VFDs, a clean, conditioned space with temperatures between 14° F and 104° F provides an environment for ideal operation. Heaters are an option in order to keep your VFD at its recommended temperature.
- Honeywell SmartVFD HVAC has a model range from 1.5-250 HP for 460 Vac, 0.75-125 HP for 208/230 Vac.
- Honeywell SmartVFD offers a standard 3-year warranty from the date of purchase.

Find all SmartVFD selection information on the following pages

SmartVFD HVAC Drive Alone

	HP	AMPS	Frame	NEMA 1 Drive Alone	NEMA 12 Drive Alone	NEMA 3R Drive Alone
460 Vac	1.5	3.4	4	HVFDSD3C0015G100	HVFDSD3C0015G200	HVFDSD3C0015G300
	2	4.8	4	HVFDSD3C0020G100	HVFDSD3C0020G200	HVFDSD3C0020G300
	3	5.6	4	HVFDSD3C0030G100	HVFDSD3C0030G200	HVFDSD3C0030G300
	4	8	4	HVFDSD3C0040G100	HVFDSD3C0040G200	HVFDSD3C0040G300
	5	9.6	4	HVFDSD3C0050G100	HVFDSD3C0050G200	HVFDSD3C0050G300
	7.5	12	4	HVFDSD3C0075G100	HVFDSD3C0075G200	HVFDSD3C0075G300
	10	16	5	HVFDSD3C0100G100	HVFDSD3C0100G200	HVFDSD3C0100G300
	15	23	5	HVFDSD3C0150G100	HVFDSD3C0150G200	HVFDSD3C0150G300
	20	31	5	HVFDSD3C0200G100	HVFDSD3C0200G200	HVFDSD3C0200G300
	25	38	6	HVFDSD3C0250G100	HVFDSD3C0250G200	HVFDSD3C0250G300
	30	46	6	HVFDSD3C0300G100	HVFDSD3C0300G200	HVFDSD3C0300G300
	40	61	6	HVFDSD3C0400G100	HVFDSD3C0400G200	HVFDSD3C0400G300
	50	72	7	HVFDSD3C0500G100	HVFDSD3C0500G200	HVFDSD3C0500G300
	60	87	7	HVFDSD3C0600G100	HVFDSD3C0600G200	HVFDSD3C0600G300
	75	105	7	HVFDSD3C0750G100	HVFDSD3C0750G200	HVFDSD3C0750G300
	100	140	8	HVFDSD3C1000G100	HVFDSD3C1000G200	HVFDSD3C1000G300
	125	170	8	HVFDSD3C1250G100	HVFDSD3C1250G200	HVFDSD3C1250G300
	150	205	8	HVFDSD3C1500G100	HVFDSD3C1500G200	HVFDSD3C1500G300
	200	261	9	HVFDSD3C2000G100	HVFDSD3C2000G200	-
	250	310	9	HVFDSD3C2500G100	HVFDSD3C2500G200	-
	HP	AMPS	Frame	NEMA 1 Drive Alone	NEMA 12 Drive Alone	NEMA 3R Drive Alone
208/ 230 Vac	.75	3.7	4	HVFDSD3A0007G100	HVFDSD3A0007G200	HVFDSD3A0007G300
	1	4.8	4	HVFDSD3A0010G100	HVFDSD3A0010G200	HVFDSD3A0010G300
	1.5	6.6	4	HVFDSD3A0015G100	HVFDSD3A0015G200	HVFDSD3A0015G300
	2	8	4	HVFDSD3A0020G100	HVFDSD3A0020G200	HVFDSD3A0020G300
	3	11	4	HVFDSD3A0030G100	HVFDSD3A0030G200	HVFDSD3A0030G300
	5	18	5	HVFDSD3A0050G100	HVFDSD3A0050G200	HVFDSD3A0050G300
	7.5	24	5	HVFDSD3A0075G100	HVFDSD3A0075G200	HVFDSD3A0075G300
	10	31	5	HVFDSD3A0100G100	HVFDSD3A0100G200	HVFDSD3A0100G300
	15	48	6	HVFDSD3A0150G100	HVFDSD3A0150G200	HVFDSD3A0150G300
	20	62	6	HVFDSD3A0200G100	HVFDSD3A0200G200	HVFDSD3A0200G300
	25	75	7	HVFDSD3A0250G100	HVFDSD3A0250G200	HVFDSD3A0250G300
	30	88	7	HVFDSD3A0300G100	HVFDSD3A0300G200	HVFDSD3A0300G300
	40	105	7	HVFDSD3A0400G100	HVFDSD3A0400G200	HVFDSD3A0400G300
	50	140	8	HVFDSD3A0500G100	HVFDSD3A0500G200	HVFDSD3A0500G300
	60	170	8	HVFDSD3A0600G100	HVFDSD3A0600G200	HVFDSD3A0600G300
	75	205	8	HVFDSD3A0750G100	HVFDSD3A0750G200	HVFDSD3A0750G300
	100	261	9	HVFDSD3A1000G100	HVFDSD3A1000G200	-
	125	310	9	HVFDSD3A1250G100	HVFDSD3A1250G200	-

SmartVFD HVAC NEMA 1 Disconnect and SmartVFD BYPASS

	HP	AMPS	Frame	NEMA 1 Fused Disconnect	NEMA 1 2-Contactor Bypass	NEMA 1 3-Contactor Bypass	NEMA 1 3-Cont. Bypass + Auto-Bypass
460 Vac	1.5	3.4	4	HVFDSB3C0015G110	HVFDSB3C0015G120	HVFDSB3C0015G130	HVFDSB3C0015G131
	2	4.8	4	HVFDSB3C0020G110	HVFDSB3C0020G120	HVFDSB3C0020G130	HVFDSB3C0020G131
	3	5.6	4	HVFDSB3C0030G110	HVFDSB3C0030G120	HVFDSB3C0030G130	HVFDSB3C0030G131
	4	8	4	HVFDSB3C0040G110	HVFDSB3C0040G120	HVFDSB3C0040G130	HVFDSB3C0040G131
	5	9.6	4	HVFDSB3C0050G110	HVFDSB3C0050G120	HVFDSB3C0050G130	HVFDSB3C0050G131
	7.5	12	4	HVFDSB3C0075G110	HVFDSB3C0075G120	HVFDSB3C0075G130	HVFDSB3C0075G131
	10	16	5	HVFDSB3C0100G110	HVFDSB3C0100G120	HVFDSB3C0100G130	HVFDSB3C0100G131
	15	23	5	HVFDSB3C0150G110	HVFDSB3C0150G120	HVFDSB3C0150G130	HVFDSB3C0150G131
	20	31	5	HVFDSB3C0200G110	HVFDSB3C0200G120	HVFDSB3C0200G130	HVFDSB3C0200G131
	25	38	6	HVFDSB3C0250G110	HVFDSB3C0250G120	HVFDSB3C0250G130	HVFDSB3C0250G131
	30	46	6	HVFDSB3C0300G110	HVFDSB3C0300G120	HVFDSB3C0300G130	HVFDSB3C0300G131
	40	61	6	HVFDSB3C0400G110	HVFDSB3C0400G120	HVFDSB3C0400G130	HVFDSB3C0400G131
	50	72	7	HVFDSB3C0500G110	HVFDSB3C0500G120	HVFDSB3C0500G130	HVFDSB3C0500G131
	60	87	7	HVFDSB3C0600G110	HVFDSB3C0600G120	HVFDSB3C0600G130	HVFDSB3C0600G131
	75	105	7	HVFDSB3C0750G110	HVFDSB3C0750G120	HVFDSB3C0750G130	HVFDSB3C0750G131
	100	140	8	HVFDSB3C1000G110	HVFDSB3C1000G120	HVFDSB3C1000G130	HVFDSB3C1000G131
	125	170	8	HVFDSB3C1250G110	HVFDSB3C1250G120	HVFDSB3C1250G130	HVFDSB3C1250G131
	150	205	8	HVFDSB3C1500G110	HVFDSB3C1500G120	HVFDSB3C1500G130	HVFDSB3C1500G131
	HP	AMPS	Frame	NEMA 1 Fused Disconnect	NEMA 1 2-Contactor Bypass	NEMA 1 3-Contactor Bypass	NEMA 1 3-Cont. Bypass + Auto-Bypass
208 Vac	.75	3.7	4	HVFDSB3A0007G110	HVFDSB3A0007G120	HVFDSB3A0007G130	HVFDSB3A0007G131
	1	4.8	4	HVFDSB3A0010G110	HVFDSB3A0010G120	HVFDSB3A0010G130	HVFDSB3A0010G131
	1.5	6.6	4	HVFDSB3A0015G110	HVFDSB3A0015G120	HVFDSB3A0015G130	HVFDSB3A0015G131
	2	8	4	HVFDSB3A0020G110	HVFDSB3A0020G120	HVFDSB3A0020G130	HVFDSB3A0020G131
	3	11	4	HVFDSB3A0030G110	HVFDSB3A0030G120	HVFDSB3A0030G130	HVFDSB3A0030G131
	5	18	5	HVFDSB3A0050G110	HVFDSB3A0050G120	HVFDSB3A0050G130	HVFDSB3A0050G131
	7.5	24	5	HVFDSB3A0075G110	HVFDSB3A0075G120	HVFDSB3A0075G130	HVFDSB3A0075G131
	10	31	5	HVFDSB3A0100G110	HVFDSB3A0100G120	HVFDSB3A0100G130	HVFDSB3A0100G131
	15	48	6	HVFDSB3A0150G110	HVFDSB3A0150G120	HVFDSB3A0150G130	HVFDSB3A0150G131
	20	62	6	HVFDSB3A0200G110	HVFDSB3A0200G120	HVFDSB3A0200G130	HVFDSB3A0200G131
	25	75	7	HVFDSB3A0250G110	HVFDSB3A0250G120	HVFDSB3A0250G130	HVFDSB3A0250G131
	30	88	7	HVFDSB3A0300G110	HVFDSB3A0300G120	HVFDSB3A0300G130	HVFDSB3A0300G131
	40	105	7	HVFDSB3A0400G110	HVFDSB3A0400G120	HVFDSB3A0400G130	HVFDSB3A0400G131
	50	140	8	HVFDSB3A0500G110	HVFDSB3A0500G120	HVFDSB3A0500G130	HVFDSB3A0500G131
	60	170	8	HVFDSB3A0600G110	HVFDSB3A0600G120	HVFDSB3A0600G130	HVFDSB3A0600G131
	75	205	8	HVFDSB3A0750G110	HVFDSB3A0750G120	HVFDSB3A0750G130	HVFDSB3A0750G131
	HP	AMPS	Frame	NEMA 1 Fused Disconnect	NEMA 1 2-Contactor Bypass	NEMA 1 3-Contactor Bypass	NEMA 1 3-Cont. Bypass + Auto-Bypass
230 Vac	.75	3.7	4	HVFDSB3B0007G110	HVFDSB3B0007G120	HVFDSB3B0007G130	HVFDSB3B0007G131
	1	4.8	4	HVFDSB3B0010G110	HVFDSB3B0010G120	HVFDSB3B0010G130	HVFDSB3B0010G131
	1.5	6.6	4	HVFDSB3B0015G110	HVFDSB3B0015G120	HVFDSB3B0015G130	HVFDSB3B0015G131
	2	8	4	HVFDSB3B0020G110	HVFDSB3B0020G120	HVFDSB3B0020G130	HVFDSB3B0020G131
	3	11	4	HVFDSB3B0030G110	HVFDSB3B0030G120	HVFDSB3B0030G130	HVFDSB3B0030G131
	5	18	5	HVFDSB3B0050G110	HVFDSB3B0050G120	HVFDSB3B0050G130	HVFDSB3B0050G131
	7.5	24	5	HVFDSB3B0075G110	HVFDSB3B0075G120	HVFDSB3B0075G130	HVFDSB3B0075G131
	10	31	5	HVFDSB3B0100G110	HVFDSB3B0100G120	HVFDSB3B0100G130	HVFDSB3B0100G131
	15	48	6	HVFDSB3B0150G110	HVFDSB3B0150G120	HVFDSB3B0150G130	HVFDSB3B0150G131
	20	62	6	HVFDSB3B0200G110	HVFDSB3B0200G120	HVFDSB3B0200G130	HVFDSB3B0200G131
	25	75	7	HVFDSB3B0250G110	HVFDSB3B0250G120	HVFDSB3B0250G130	HVFDSB3B0250G131
	30	88	7	HVFDSB3B0300G110	HVFDSB3B0300G120	HVFDSB3B0300G130	HVFDSB3B0300G131
	40	105	7	HVFDSB3B0400G110	HVFDSB3B0400G120	HVFDSB3B0400G130	HVFDSB3B0400G131
	50	140	8	HVFDSB3B0500G110	HVFDSB3B0500G120	HVFDSB3B0500G130	HVFDSB3B0500G131
	60	170	8	HVFDSB3B0600G110	HVFDSB3B0600G120	HVFDSB3B0600G130	HVFDSB3B0600G131
	75	205	8	HVFDSB3B0750G110	HVFDSB3B0750G120	HVFDSB3B0750G130	HVFDSB3B0750G131

Smart Selection

SmartVFD HVAC NEMA 12 Disconnect and SmartVFD BYPASS

	HP	AMPS	Frame	NEMA 12 Fused Disconnect	NEMA 12 2-Contactor Bypass	NEMA 12 3-Contactor Bypass	NEMA 12 3-Cont. Bypass + Auto-Bypass
460 Vac	1.5	3.4	4	HVFDSB3C0015G210	HVFDSB3C0015G220	HVFDSB3C0015G230	HVFDSB3C0015G231
	2	4.8	4	HVFDSB3C0020G210	HVFDSB3C0020G220	HVFDSB3C0020G230	HVFDSB3C0020G231
	3	5.6	4	HVFDSB3C0030G210	HVFDSB3C0030G220	HVFDSB3C0030G230	HVFDSB3C0030G231
	4	8	4	HVFDSB3C0040G210	HVFDSB3C0040G220	HVFDSB3C0040G230	HVFDSB3C0040G231
	5	9.6	4	HVFDSB3C0050G210	HVFDSB3C0050G220	HVFDSB3C0050G230	HVFDSB3C0050G231
	7.5	12	4	HVFDSB3C0075G210	HVFDSB3C0075G220	HVFDSB3C0075G230	HVFDSB3C0075G231
	10	16	5	HVFDSB3C0100G210	HVFDSB3C0100G220	HVFDSB3C0100G230	HVFDSB3C0100G231
	15	23	5	HVFDSB3C0150G210	HVFDSB3C0150G220	HVFDSB3C0150G230	HVFDSB3C0150G231
	20	31	5	HVFDSB3C0200G210	HVFDSB3C0200G220	HVFDSB3C0200G230	HVFDSB3C0200G231
	25	38	6	HVFDSB3C0250G210	HVFDSB3C0250G220	HVFDSB3C0250G230	HVFDSB3C0250G231
	30	46	6	HVFDSB3C0300G210	HVFDSB3C0300G220	HVFDSB3C0300G230	HVFDSB3C0300G231
	40	61	6	HVFDSB3C0400G210	HVFDSB3C0400G220	HVFDSB3C0400G230	HVFDSB3C0400G231
	50	72	7	HVFDSB3C0500G210	HVFDSB3C0500G220	HVFDSB3C0500G230	HVFDSB3C0500G231
	60	87	7	HVFDSB3C0600G210	HVFDSB3C0600G220	HVFDSB3C0600G230	HVFDSB3C0600G231
	75	105	7	HVFDSB3C0750G210	HVFDSB3C0750G220	HVFDSB3C0750G230	HVFDSB3C0750G231
	100	140	8	HVFDSB3C1000G210	HVFDSB3C1000G220	HVFDSB3C1000G230	HVFDSB3C1000G231
	125	170	8	HVFDSB3C1250G210	HVFDSB3C1250G220	HVFDSB3C1250G230	HVFDSB3C1250G231
	150	205	8	HVFDSB3C1500G210	HVFDSB3C1500G220	HVFDSB3C1500G230	HVFDSB3C1500G231
	HP	AMPS	Frame	NEMA 12 Fused Disconnect	NEMA 12 2-Contactor Bypass	NEMA 12 3-Contactor Bypass	NEMA 12 3-Cont. Bypass + Auto-Bypass
208 Vac	.75	3.7	4	HVFDSB3A0007G210	HVFDSB3A0007G220	HVFDSB3A0007G230	HVFDSB3A0007G231
	1	4.8	4	HVFDSB3A0010G210	HVFDSB3A0010G220	HVFDSB3A0010G230	HVFDSB3A0010G231
	1.5	6.6	4	HVFDSB3A0015G210	HVFDSB3A0015G220	HVFDSB3A0015G230	HVFDSB3A0015G231
	2	8	4	HVFDSB3A0020G210	HVFDSB3A0020G220	HVFDSB3A0020G230	HVFDSB3A0020G231
	3	11	4	HVFDSB3A0030G210	HVFDSB3A0030G220	HVFDSB3A0030G230	HVFDSB3A0030G231
	5	18	5	HVFDSB3A0050G210	HVFDSB3A0050G220	HVFDSB3A0050G230	HVFDSB3A0050G231
	7.5	24	5	HVFDSB3A0075G210	HVFDSB3A0075G220	HVFDSB3A0075G230	HVFDSB3A0075G231
	10	31	5	HVFDSB3A0100G210	HVFDSB3A0100G220	HVFDSB3A0100G230	HVFDSB3A0100G231
	15	48	6	HVFDSB3A0150G210	HVFDSB3A0150G220	HVFDSB3A0150G230	HVFDSB3A0150G231
	20	62	6	HVFDSB3A0200G210	HVFDSB3A0200G220	HVFDSB3A0200G230	HVFDSB3A0200G231
	25	75	7	HVFDSB3A0250G210	HVFDSB3A0250G220	HVFDSB3A0250G230	HVFDSB3A0250G231
	30	88	7	HVFDSB3A0300G210	HVFDSB3A0300G220	HVFDSB3A0300G230	HVFDSB3A0300G231
	40	105	7	HVFDSB3A0400G210	HVFDSB3A0400G220	HVFDSB3A0400G230	HVFDSB3A0400G231
	50	140	8	HVFDSB3A0500G210	HVFDSB3A0500G220	HVFDSB3A0500G230	HVFDSB3A0500G231
	60	170	8	HVFDSB3A0600G210	HVFDSB3A0600G220	HVFDSB3A0600G230	HVFDSB3A0600G231
	75	205	8	HVFDSB3A0750G210	HVFDSB3A0750G220	HVFDSB3A0750G230	HVFDSB3A0750G231
	HP	AMPS	Frame	NEMA 12 Fused Disconnect	NEMA 12 2-Contactor Bypass	NEMA 12 3-Contactor Bypass	NEMA 12 3-Cont. Bypass + Auto-Bypass
230 Vac	.75	3.7	4	HVFDSB3B0007G210	HVFDSB3B0007G220	HVFDSB3B0007G230	HVFDSB3B0007G231
	1	4.8	4	HVFDSB3B0010G210	HVFDSB3B0010G220	HVFDSB3B0010G230	HVFDSB3B0010G231
	1.5	6.6	4	HVFDSB3B0015G210	HVFDSB3B0015G220	HVFDSB3B0015G230	HVFDSB3B0015G231
	2	8	4	HVFDSB3B0020G210	HVFDSB3B0020G220	HVFDSB3B0020G230	HVFDSB3B0020G231
	3	11	4	HVFDSB3B0030G210	HVFDSB3B0030G220	HVFDSB3B0030G230	HVFDSB3B0030G231
	5	18	5	HVFDSB3B0050G210	HVFDSB3B0050G220	HVFDSB3B0050G230	HVFDSB3B0050G231
	7.5	24	5	HVFDSB3B0075G210	HVFDSB3B0075G220	HVFDSB3B0075G230	HVFDSB3B0075G231
	10	31	5	HVFDSB3B0100G210	HVFDSB3B0100G220	HVFDSB3B0100G230	HVFDSB3B0100G231
	15	48	6	HVFDSB3B0150G210	HVFDSB3B0150G220	HVFDSB3B0150G230	HVFDSB3B0150G231
	20	62	6	HVFDSB3B0200G210	HVFDSB3B0200G220	HVFDSB3B0200G230	HVFDSB3B0200G231
	25	75	7	HVFDSB3B0250G210	HVFDSB3B0250G220	HVFDSB3B0250G230	HVFDSB3B0250G231
	30	88	7	HVFDSB3B0300G210	HVFDSB3B0300G220	HVFDSB3B0300G230	HVFDSB3B0300G231
	40	105	7	HVFDSB3B0400G210	HVFDSB3B0400G220	HVFDSB3B0400G230	HVFDSB3B0400G231
	50	140	8	HVFDSB3B0500G210	HVFDSB3B0500G220	HVFDSB3B0500G230	HVFDSB3B0500G231
	60	170	8	HVFDSB3B0600G210	HVFDSB3B0600G220	HVFDSB3B0600G230	HVFDSB3B0600G231
	75	205	8	HVFDSB3B0750G210	HVFDSB3B0750G220	HVFDSB3B0750G230	HVFDSB3B0750G231

SmartVFD HVAC NEMA 3R Disconnect and SmartVFD BYPASS

	HP	AMPS	Frame	NEMA 3R Fused Disconnect	NEMA 3R 2-Contactor Bypass	NEMA 3R 3-Contactor Bypass	NEMA 3R 3-Cont. Bypass + Auto-Bypass
460 Vac	1.5	3.4	4	HVFDSB3C0015G310	HVFDSB3C0015G320	HVFDSB3C0015G330	HVFDSB3C0015G331
	2	4.8	4	HVFDSB3C0020G310	HVFDSB3C0020G320	HVFDSB3C0020G330	HVFDSB3C0020G331
	3	5.6	4	HVFDSB3C0030G310	HVFDSB3C0030G320	HVFDSB3C0030G330	HVFDSB3C0030G331
	4	8	4	HVFDSB3C0040G310	HVFDSB3C0040G320	HVFDSB3C0040G330	HVFDSB3C0040G331
	5	9.6	4	HVFDSB3C0050G310	HVFDSB3C0050G320	HVFDSB3C0050G330	HVFDSB3C0050G331
	7.5	12	4	HVFDSB3C0075G310	HVFDSB3C0075G320	HVFDSB3C0075G330	HVFDSB3C0075G331
	10	16	5	HVFDSB3C0100G310	HVFDSB3C0100G320	HVFDSB3C0100G330	HVFDSB3C0100G331
	15	23	5	HVFDSB3C0150G310	HVFDSB3C0150G320	HVFDSB3C0150G330	HVFDSB3C0150G331
	20	31	5	HVFDSB3C0200G310	HVFDSB3C0200G320	HVFDSB3C0200G330	HVFDSB3C0200G331
	25	38	6	HVFDSB3C0250G310	HVFDSB3C0250G320	HVFDSB3C0250G330	HVFDSB3C0250G331
	30	46	6	HVFDSB3C0300G310	HVFDSB3C0300G320	HVFDSB3C0300G330	HVFDSB3C0300G331
	40	61	6	HVFDSB3C0400G310	HVFDSB3C0400G320	HVFDSB3C0400G330	HVFDSB3C0400G331
	50	72	7	HVFDSB3C0500G310	HVFDSB3C0500G320	HVFDSB3C0500G330	HVFDSB3C0500G331
	60	87	7	HVFDSB3C0600G310	HVFDSB3C0600G320	HVFDSB3C0600G330	HVFDSB3C0600G331
	75	105	7	HVFDSB3C0750G310	HVFDSB3C0750G320	HVFDSB3C0750G330	HVFDSB3C0750G331
	100	140	8	HVFDSB3C1000G310	HVFDSB3C1000G320	HVFDSB3C1000G330	HVFDSB3C1000G331
	125	170	8	HVFDSB3C1250G310	HVFDSB3C1250G320	HVFDSB3C1250G330	HVFDSB3C1250G331
	150	205	8	HVFDSB3C1500G310	HVFDSB3C1500G320	HVFDSB3C1500G330	HVFDSB3C1500G331
	HP	AMPS	Frame	NEMA 3R Fused Disconnect	NEMA 3R 2-Contactor Bypass	NEMA 3R 3-Contactor Bypass	NEMA 3R 3-Cont. Bypass + Auto-Bypass
208 Vac	.75	3.7	4	HVFDSB3A0007G310	HVFDSB3A0007G320	HVFDSB3A0007G330	HVFDSB3A0007G331
	1	4.8	4	HVFDSB3A0010G310	HVFDSB3A0010G320	HVFDSB3A0010G330	HVFDSB3A0010G331
	1.5	6.6	4	HVFDSB3A0015G310	HVFDSB3A0015G320	HVFDSB3A0015G330	HVFDSB3A0015G331
	2	8	4	HVFDSB3A0020G310	HVFDSB3A0020G320	HVFDSB3A0020G330	HVFDSB3A0020G331
	3	11	4	HVFDSB3A0030G310	HVFDSB3A0030G320	HVFDSB3A0030G330	HVFDSB3A0030G331
	5	18	5	HVFDSB3A0050G310	HVFDSB3A0050G320	HVFDSB3A0050G330	HVFDSB3A0050G331
	7.5	24	5	HVFDSB3A0075G310	HVFDSB3A0075G320	HVFDSB3A0075G330	HVFDSB3A0075G331
	10	31	5	HVFDSB3A0100G310	HVFDSB3A0100G320	HVFDSB3A0100G330	HVFDSB3A0100G331
	15	48	6	HVFDSB3A0150G310	HVFDSB3A0150G320	HVFDSB3A0150G330	HVFDSB3A0150G331
	20	62	6	HVFDSB3A0200G310	HVFDSB3A0200G320	HVFDSB3A0200G330	HVFDSB3A0200G331
	25	75	7	HVFDSB3A0250G310	HVFDSB3A0250G320	HVFDSB3A0250G330	HVFDSB3A0250G331
	30	88	7	HVFDSB3A0300G310	HVFDSB3A0300G320	HVFDSB3A0300G330	HVFDSB3A0300G331
	40	105	7	HVFDSB3A0400G310	HVFDSB3A0400G320	HVFDSB3A0400G330	HVFDSB3A0400G331
	50	140	8	HVFDSB3A0500G310	HVFDSB3A0500G320	HVFDSB3A0500G330	HVFDSB3A0500G331
	60	170	8	HVFDSB3A0600G310	HVFDSB3A0600G320	HVFDSB3A0600G330	HVFDSB3A0600G331
	75	205	8	HVFDSB3A0750G310	HVFDSB3A0750G320	HVFDSB3A0750G330	HVFDSB3A0750G331
	HP	AMPS	Frame	NEMA 3R Fused Disconnect	NEMA 3R 2-Contactor Bypass	NEMA 3R 3-Contactor Bypass	NEMA 3R 3-Cont. Bypass + Auto-Bypass
230 Vac	.75	3.7	4	HVFDSB3B0007G310	HVFDSB3B0007G320	HVFDSB3B0007G330	HVFDSB3B0007G331
	1	4.8	4	HVFDSB3B0010G310	HVFDSB3B0010G320	HVFDSB3B0010G330	HVFDSB3B0010G331
	1.5	6.6	4	HVFDSB3B0015G310	HVFDSB3B0015G320	HVFDSB3B0015G330	HVFDSB3B0015G331
	2	8	4	HVFDSB3B0020G310	HVFDSB3B0020G320	HVFDSB3B0020G330	HVFDSB3B0020G331
	3	11	4	HVFDSB3B0030G310	HVFDSB3B0030G320	HVFDSB3B0030G330	HVFDSB3B0030G331
	5	18	5	HVFDSB3B0050G310	HVFDSB3B0050G320	HVFDSB3B0050G330	HVFDSB3B0050G331
	7.5	24	5	HVFDSB3B0075G310	HVFDSB3B0075G320	HVFDSB3B0075G330	HVFDSB3B0075G331
	10	31	5	HVFDSB3B0100G310	HVFDSB3B0100G320	HVFDSB3B0100G330	HVFDSB3B0100G331
	15	48	6	HVFDSB3B0150G310	HVFDSB3B0150G320	HVFDSB3B0150G330	HVFDSB3B0150G331
	20	62	6	HVFDSB3B0200G310	HVFDSB3B0200G320	HVFDSB3B0200G330	HVFDSB3B0200G331
	25	75	7	HVFDSB3B0250G310	HVFDSB3B0250G320	HVFDSB3B0250G330	HVFDSB3B0250G331
	30	88	7	HVFDSB3B0300G310	HVFDSB3B0300G320	HVFDSB3B0300G330	HVFDSB3B0300G331
	40	105	7	HVFDSB3B0400G310	HVFDSB3B0400G320	HVFDSB3B0400G330	HVFDSB3B0400G331
	50	140	8	HVFDSB3B0500G310	HVFDSB3B0500G320	HVFDSB3B0500G330	HVFDSB3B0500G331
	60	170	8	HVFDSB3B0600G310	HVFDSB3B0600G320	HVFDSB3B0600G330	HVFDSB3B0600G331
	75	205	8	HVFDSB3B0750G310	HVFDSB3B0750G320	HVFDSB3B0750G330	HVFDSB3B0750G331

Smart Selection

VFD Pricing/Job Estimating Tools

For additional tools you can use for the selection and pricing of VFDs, click on the "Commercial Components Estimating Tools" link at ***customer.honeywell.com.***

NEMA 1

Frame Size	HP And Voltage		Configuration	Dimensions (in)			Weight (lb)
	208/230 VAC	460 VAC		W	H	D	
4	0.75-3 HP	1.5-7.5 HP	Drive alone	5	12.9	7.5	13.2
			Disconnect	8.9	31.9	10.3	33
			2-Contactor	8.9	31.9	9.6	38
			3-Contactor	8.9	38.9	10.3	44
			3-Contactor with Auto-Bypass	8.9	38.9	10.3	46
5	5 HP 7.5 HP 10 HP	10 HP 15 HP 20 HP	Drive alone	5.7	16.5	8.4	22
			Disconnect	8.9	34.7	10.3	43
			2-Contactor	8.9	34.7	9.6	48/50/50
			3-Contactor	8.9	41.7	10.3/10.3/10.8	55.5/57/59.5
			3-Contactor with Auto-Bypass	8.9	41.7	10.3/10.3/10.8	56/57.5/60
6	15 HP 20 HP	25 HP 30 HP 40 HP	Drive alone	7.7	21.9	9	44.1
			Disconnect	12.4	45.1	11.3	50
			2-Contactor	12.4	45.1	10.1	55/59
			3-Contactor	12.4	55.2	11.3	94.5/98.5/105.5
			3-Contactor with Auto-Bypass	12.4	55.2	11.3	96.5/100.5/107.5
7	25 HP 30 HP 40 HP	50 HP 60 HP 75 HP	Drive alone	9.3	25.4	10.2	82.7
			Disconnect	20.8	51.5	13.2	100
			2-Contactor	20.8	51.5	12.2	169/179/189
			3-Contactor	20.8	59	13.2	175/184/195
			3-Contactor with Auto-Bypass	20.8	59	13.2	177/186/197
8	50 HP 60 HP 75 HP	100 HP 125 HP 150 HP	Drive alone	11.4	38	13.5	154.3
			Disconnect	25	60	16.2	200
			2-Contactor	25	60	15.2	250/265/280
			3-Contactor	25	70	16.2	285/295/331
			3-Contactor with Auto-Bypass	25	70	16.2	287/297/333
9	100-125 HP	200-250 HP	Drive alone	18.9	45.3	14.4	238.1

NEMA 12

Frame Size	HP And Voltage		Configuration	208/230 Vac Dimensions (in) & Weight (lb)				460 Vac Dimensions (in) & Weight (lb)			
	208/230 VAC	460 VAC		W	H	D	lb	W	H	D	lb
4	0.75-3 HP	1.5HP-7.5 HP	Drive alone	5	12.9	7.5	13.2	5	12.9	7.5	13.2
			Disconnect	12	37.5	11	40	12	37.5	11	40
			2-Contactor	16	37.5	11	55	16	37.5	11	53
			3-Contactor	16	37.5	11	55	16	37.5	11	53
			3-Contactor with Auto-Bypass	16	37.5	11	55	16	37.5	11	53
5	5-10 HP	10 HP 15 HP 20 HP	Drive alone	5.7	16.5	8.4	22	5.7	16.5	8.4	22
			Disconnect	12	41	11	72	12	41	11	72
			2-Contactor	16	41/41/45	11	70/70/84	16	41/41/45	11	64/64/76
			3-Contactor	16	41/41/45	11	70/70/84	16	41/41/45	11	64/64/76
			3-Contactor with Auto-Bypass	16	41/41/45	11	70/70/84	16	41/41/45	11	64/64/76
6	15-20 HP	25 HP 30 HP 40 HP	Drive alone	7.7	21.9	9	44.1	7.7	21.9	9	44.1
			Disconnect	12	46.5	13	120	12/12/16	46.5	13	120/120/136
			2-Contactor	16/20	50.5/54.5	13	125/140	16/16/20	50.5/50.5/54.5	13	120/120/136
			3-Contactor	16/20	50.5/54.5	13	125/140	16/16/20	50.5/50.5/54.5	13	120/120/136
			3-Contactor with Auto-Bypass	16/20	50.5/54.5	13	125/140	16/16/20	50.5/50.5/54.5	13	120/120/136
7	25-40 HP	50 HP 60 HP 75 HP	Drive alone	9.3	25.4	10.2	82.7	9.3	25.4	10.2	82.7
			Disconnect	16	50.5	13.5	145/160/175	16	50.5	13.5	145/160/175
			2-Contactor	20/24/30	58.5/65.5/70.5	13.5	160/175/200	20/24/30	58.5/65.5/70.5	13.5	150/165/193
			3-Contactor	20/24/30	58.5/65.5/70.5	13.5	160/175/200	20/24/30	58.5/65.5/70.5	13.5	150/165/193
			3-Contactor with Auto-Bypass	20/24/30	58.5/65.5/70.5	13.5	160/175/200	20/24/30	58.5/65.5/70.5	13.5	150/165/193
8	50-75 HP	100 HP 125 HP 150 HP	Drive alone	11.4	38	13.5	154.3	11.42	38.03	13.5	154.3
			Disconnect	Contact Customer Care				Contact Customer Care			
			2-Contactor								
			3-Contactor								
			3-Contactor with Auto-Bypass								
9	100-125 HP	180-220 HP	Drive alone	18.9	45.3	14.4	238.1	14.37	45.27	18.9	238.1

NEMA 3R

Frame Size	HP And Voltage		Configuration	Dimensions (in)			Weight (lb)
	208/230 VAC	460 VAC		W	H	D	
4	0.75-3 HP	1.5-7.5 HP	Drive alone	20.5	20	10.5	39
			Disconnect	20.5	20	12	43
			2-Contactor	24.5	24	10.5	49
			3-Contactor	24.5	24	12	54
			3-Contactor with Auto-Bypass	24.5	24	12	54
5	5-10 HP	10-20 HP	Drive alone	20.5	24	10.5	58
			Disconnect	20.5	24	12	61
			2-Contactor	24.5	24	10.5	72
			3-Contactor	28.5	30	12	78
			3-Contactor with Auto-Bypass	28.5	30	12	78
6	15-20 HP	25-40 HP	Drive alone	28.5	36	10.5	80
			Disconnect	28.5	36	12	88
			2-Contactor	28.5	36	10.5	118
			3-Contactor	34.5	36	12	124
			3-Contactor with Auto-Bypass	34.5	36	12	124
7	25-40 HP	50-75 HP	Drive alone	28.5	48	12.5	130
			Disconnect	28.5	48	14	149
			2-Contactor	28.5	48	12.5	185
			3-Contactor	40.5	48	14	193
			3-Contactor with Auto-Bypass	40.5	48	14	193
8	50-75 HP	100-150 HP	Drive alone	40.5	60	12.5	299
			Disconnect	40.5	60	14	340
			2-Contactor	40.5	60	12.5	430
			3-Contactor	40.5	60	14	440
			3-Contactor with Auto-Bypass	40.5	60	14	440

Honeywell SmartVFD HVAC and SmartVFD BYPASS are smaller, sleeker and require a smaller footprint than other manufacturers. They are specifically designed for your HVAC application.

Smart Accessories

SmartVFD Accessories

Accessory	Description	Drive Used with
32006630-001/U	LON Communication Card (NXOPTC4)	SMART
HVFDSDOPT1AI2AO/U	1 x AI, 2 x AO (isolated, D- and E- slot compatible)	SMART
HVFDSDOPT1RO5DI/U	1 x RO, 5 x DI (42-240 VAC, D- and E- slot compatible)	SMART
HVFDSDREP2RO1T/U	2 x RO + Thermistor (B- slot compatible)	SMART
HVFDSDOPT2RO1T/U	2 x RO + Thermistor (D- and E- slot compatible)	SMART
HVFDSDOPT3RO/U	3 x RO (D- and E- slot compatible)	SMART
HVFDSDBATTERY/U	Battery Package, 5 pcs, for Real Time Clock	SMART
HVFDSDREP3RO/U	3 x RO (B- slot compatible)	SMART
HVFDSDOPT6DI/U	6 x DI / DO Programmable (D- and E- slot compatible)	SMART
HVFDSDTRAINER/U	SmartVFD HVAC Training Demonstration Kit	SMART
HVFDSDGRAPHICKP/U	SmartVFD HVAC Replacement Graphical Keypad	SMART
HVFDSDMOUNTKIT/U	SmartVFD HVAC Panel Mount Kit for NEMA 12 Install 3 Meter Cable	SMART
HVFDSDNEMA12FR4/U	SmartVFD HVAC NEMA 12 Kit Frame 4	SMART
HVFDSDNEMA12FR5/U	SmartVFD HVAC NEMA 12 Kit Frame 5	SMART
HVFDSDNEMA12FR6/U	SmartVFD HVAC NEMA 12 Kit Frame 6	SMART
HVFDSDFLANGEFR4/U	SmartVFD HVAC Flange Mounting Kit for Frame 4	SMART
HVFDSDFLANGEFR5/U	SmartVFD HVAC Flange Mounting Kit for Frame 5	SMART
HVFDSDFLANGEFR6/U	SmartVFD HVAC Flange Mounting Kit for Frame 6	SMART
HVFDSDFLANGEFR7/U	SmartVFD HVAC Flange Mounting Kit for Frame 7	SMART
HVFDSDFANFR4/U	SmartVFD HVAC Frame 4 Replacement Fan	SMART
HVFDSDFANFR5/U	SmartVFD HVAC Frame 5 Replacement Fan	SMART
HVFDSDFANFR6/U	SmartVFD HVAC Frame 6 Replacement Fan	SMART
HVFDSDFANFR7/U	SmartVFD HVAC Frame 7 Replacement Fan	SMART
HVFDSDINSTALLFR4/U	SmartVFD HVAC Replacement Installation Accessories Frame 4	SMART
HVFDSDINSTALLFR5/U	SmartVFD HVAC Replacement Installation Accessories Frame 5	SMART
HVFDSDINSTALLFR6/U	SmartVFD HVAC Replacement Installation Accessories Frame 6	SMART
HVFDCABLE/U	SmartVFD Compact Commissioning Cable and USB Adaptor	COMPACT & SMART

See the Big Picture

With an optional Micro Communication Adapter (MCA), you can turn your computer into a window to easily setup, operate, monitor and diagnose your SmartVFD drives. Just download the free PC Tool software from customer.honeywell.com, then use the adapter to connect to the drive.

PROGRAMMING AND COMMISSIONING

You'll have it all at your fingertips:

- Upload and download parameters to the SmartVFD drive for viewing and editing with maximum, minimum and default values for each parameter
- Directly control the drive to run it through its paces
- Save parameters for offline editing
- Directly control the drive speed in real time

MONITORING AND DIAGNOSTICS

See it all onscreen:

- Monitor parameters in real time
- Save screen shots and export values to a spreadsheet
- Pause a real-time monitoring window to capture accurate data
- For diagnostic assistance, view detailed active faults, the fault history (up to 40 stored faults), and I/O states

AIREDALE

ClassMate® Generation Comparison

UNIT FEATURES COMPARISON

New Generation Models CMD, CMP, CMS	HE Generation Models CHX, CHH
All aluminum microchannel CF® evaporator coil	Copper tube aluminum fin evaporator
Single motor and blower wheel	Single motor, dual blower wheels
Available with energy recovery ventilation section (capable of 500 CFM) and 100% economizer	Choice between fully modulating economizer damper or ERV section (capable of 450 CFM)
Fully modulating ECM ERV fans	No ERV fans
Single door design - standard	Dual door design with louvered return air in door - standard
Standard with side return, depth of cabinet stays at 30"	Available with sound door option (adds 4" to the depth of cabinet)
Single ECM condenser fan	Dual condenser PSC fans
Capable of housing two heating options along with evaporator coil within the base cabinet unit for hot gas reheat and hot water, or hot gas reheat and electric heat	Only available with one heating option in base cabinet, requires a plenum box for hot water heat or electric heat if hot gas reheat coil is selected
Head pressure control for efficient dehumidification and temperature control	Not available

PERFORMANCE COMPARISON	Units	24	36	48	60	24	36	48	60
		CMD (New)				CHX (HE Model)			
Full Load Cooling (2)									
Total Cooling	MBH	24.4	34.0	46.8	56	24.4	34.2	45.5	55
Sensible Cooling	MBH	17.5	24.3	31.5	37	20.6	27.2	35.8	43
EER	MBH/kW	12.1	11	11.64	9.74	9.6	10.1	10.35	9.19
Rated Airflow	CFM	900	1,100	1,500	1,800	900	1,100	1,400	1,700
Part Load Cooling (3)									
Total Cooling	MBH	17.1	27.3	37.1	43.4				
Sensible Cooling	MBH	11.1	19.3	24.9	29.8				
EER	MBH/kW	14.1	14.4	16.1	11.6				
Rated Airflow	CFM	700	800	1,100	1,500				
		CMP (New)				CHH (HE Model)			
Full Load Cooling (2)									
Total Cooling	MBH	22	33.5	45.2	52.7	24.4	34.2	45.5	55
Sensible Cooling	MBH	17	24	32.2	37.6	20.6	27.2	35.8	43
EER	MBH/kW	11.2	10.5	11.02	9	9.6	10.1	10.35	9.19
Rated Airflow	CFM	900	1,100	1,500	1,800	900	1,100	1,400	1,700
Full Load Heating (4)									
Total Heating	MBH	20.9	32.8	47.2	58.8	24.6	34.8	46	57
COP	W/W	3.4	3.7	4	3.6	3.07	3.41	3.49	3.31
Rated Airflow	CFM	900	1,100	1,500	1,800	900	1,100	1,400	1,700
Part Load Cooling (3)									
Total Cooling	MBH	18	26.7	36.8	43.8				
Sensible Cooling	MBH	14.6	19.1	26	33.4				
IPLV	MBH/kW	15.6	14.3	15.4	11.6				
Rated Airflow	CFM	700	800	1,100	1,500				
Part Load Heating (5)									
Total Heating	MBH	19	28.5	42.7	52.1				
COP	W/W	4.6	4.2	4.4	4.3				
Rated Airflow	CFM	700	800	1,100	1,500				

Notes:
1. Rated in accordance with AHRI 390
2. Full Load Cooling Capacity at 80/67°F Air On, 95/75°F Outdoor
3. Part Load Cooling Capacity at 80/67°F Air On, 80/67°F Outdoor
4. Full Load Heating Capacity at 70/60°F Air On, 47/43°F Outdoor
5. Part Load Heating Capacity at 70/60°F Air On, 62/56.5°F Outdoor

HE Generation

New Generation

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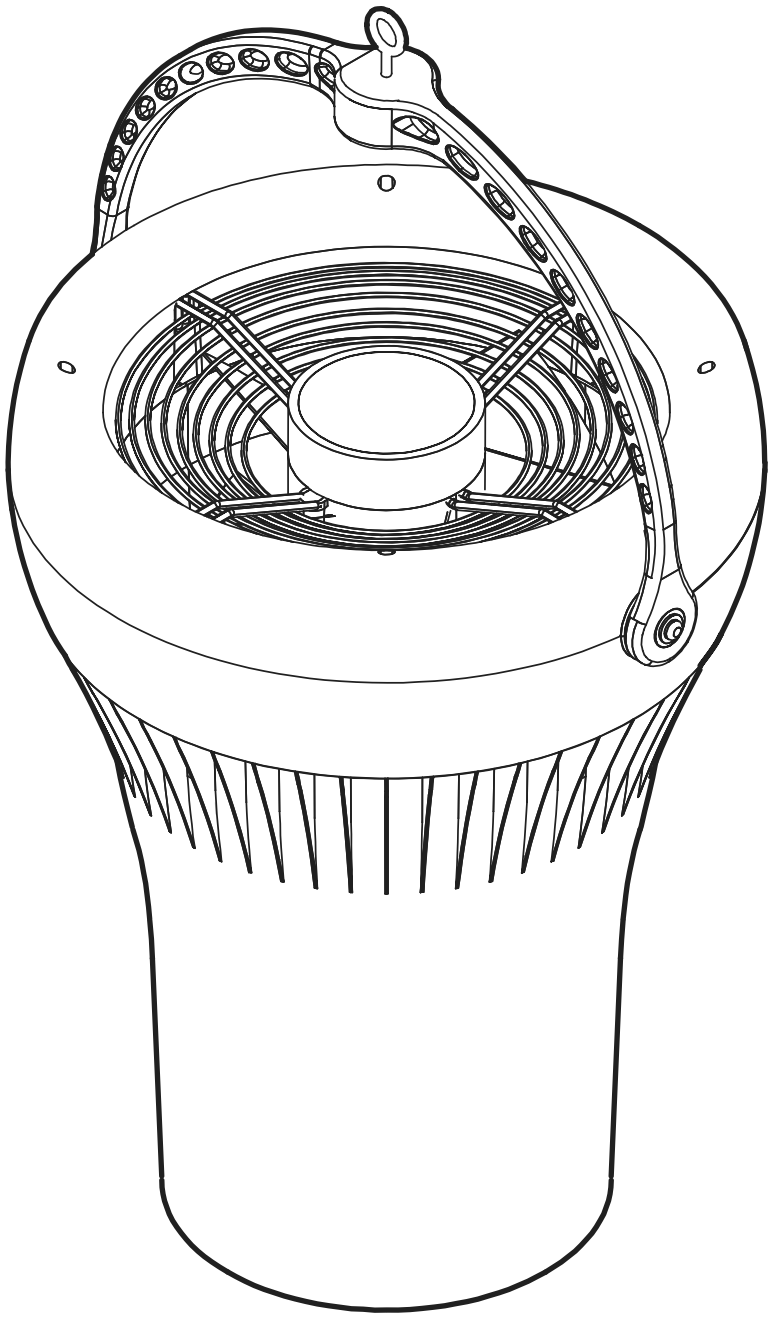
AIRIUS®

The World Standard
For Destratification

AIR PEAR
INSTALLATION, OPERATION & MAINTENANCE



Air Pear®
THE THERMAL EQUALIZER
BY AIRIUS

Installation Guide: V1.2

May be covered by one or more of the following United States Patents:
7,381,129 B2; D514688 and other patents pending

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NOTE: Carefully check fans/controls for shipping damage. Report any damage to the carrier immediately. Do not attempt to operate if visible damage is evident to either the circuit or to the electronic components. All information contained in this manual is intended to be correct, however information and data in this manual are subject to change without notice. Airius makes no warranty of any kind with regard to this information or data. Further, Airius is not responsible for any omissions or errors or consequential damage caused by the user of the product. Airius reserves the right to make manufacturing changes that may not be included in this manual.

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PC/ABS

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INTRODUCTION

Thank You!

Congratulations on the purchase of Airius' Thermal Equalizer system (Air Pear). Our patented, American-made, air-mixing system will ensure better thermal comfort in both the summer and winter while driving down expensive energy bills. We are here to support you and if you have any questions or comments, we can be contacted through our website, www.airiusfans.com, or give us a call: 1-888-247-7327.

About Air Pear Models 10, 15, 25, 45, 60 & 100

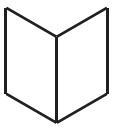
The Air Pear unit is an energy-efficient air turbine, designed to continuously move a column of air to the floor for destratification and air circulation purposes. A typical system installation includes a series of units mounted just below the ceiling, evenly spaced throughout a facility, working in concert to improve comfort and reduce HVAC energy consumption up to 35% or more*. Airius fans are available in several sizes to accommodate a wide range of ceiling heights.

* THE PERFORMANCE AND RESULTS OF THE AIR PEAR SYSTEM ARE SUBJECT TO MANY VARIABLES SUCH AS, BUT NOT LIMITED TO, AIRFLOW OBSTRUCTIONS, THE INTERIOR ENVIRONMENT, EXTERIOR ENVIRONMENT, CONDITION OF BUILDING STRUCTURE, HVAC SYSTEM PERFORMANCE AND/OR ELECTRICAL SERVICE AND THUS, ACTUAL RESULTS MAY VARY.

What's in the Box

Each unit will arrive in its own box, fully assembled. NOTE: 120VAC versions come with a three-prong plug, and other voltages have no plug supplied. You will need to have a qualified electrician either wire the desired plug on to the power cord or hard wire directly to the power circuit. We recommend using a plug for easy removal during maintenance.

Fully Assembled Air Pear or Designer Series fan



Information Sheet

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Motor Information for Air Pear Models 10, 15, 25, 45, 60 & 100

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	*dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
A-10-SP	120	50/60	0.11/0.13	13/15	1000/1050	318	24	7 lb/9 lb	Up to 12 ft.	Up to 500 ft²
A-10-SP	230	50/60	0.06/0.06	12/13	980/1000	318	24	7 lb/9 lb	Up to 12 ft.	Up to 500 ft²
A-10-EC	100-130	50/60	0.12	7	1000	318	24	7 lb/9 lb	Up to 12 ft.	Up to 500 ft²
A-10-EC	200-250	50/60	0.06	7	1000	318	24	7 lb/9 lb	Up to 12 ft.	Up to 500 ft²
A-15-SP	120	50/60	0.11/0.14	13.5/17	1230/1260	406	29	7 lb/9 lb	Up to 18 ft.	Up to 800 ft²
A-15-SP	230	50/60	0.06/0.07	15/17	1230/1260	406	29	7 lb/9 lb	Up to 18 ft.	Up to 800 ft²
A-15-EC	100-130	50/60	0.17	11	1260	406	29	7 lb/9 lb	Up to 18 ft.	Up to 800 ft²
A-15-EC	200-250	50/60	0.08	11	1260	406	29	7 lb/9 lb	Up to 18 ft.	Up to 800 ft²
A-25-SP	120	50/60	0.30/0.32	30/35	1500/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-SP	230	50/60	0.14/0.13	31/33	1450/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-SP	277	50/60	0.13/0.17	35/45	1500/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-EC	100-130	50/60	0.4	30	1700	620	51	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-EC	200-250	50/60	0.26	30	1700	620	51	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-45-P4	120	50/60	0.40/0.41	44/46	1400/1650	595/715	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P4	230	50/60	0.19/0.2	42/45	1450/1630	595/707	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P4	277	50/60	0.19/0.2	42/45	1450/1630	595/707	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P2	120	50/60	1.05/1.48	120/175	2550/2700	1057/1128	64	14 lb	Up to 45 ft.	Up to 1500 ft²
A-45-P2	230	50/60	0.54/0.7	125/165	2450/2600	1072/1160	64	14 lb	Up to 45 ft.	Up to 1500 ft²
A-45-P2	277	NA/60	NA/0.7	NA/190	NA/2900	NA/1301	64	14 lb	Up to 45 ft.	Up to 1500 ft²
A-45-EC	100-130	50/60	0 - 2.2	0 - 170	0 - 2850	0 - 1180	71	14 lb	Up to 45 ft.	Up to 1500 ft²
A-45-EC	200-277	50/60	0 - 1.4	0 - 175	0 - 3050	0 - 1290	71	14 lb	Up to 45 ft.	Up to 1500 ft²
A-45-EL	100-130	50/60	0 - 2.2	0 - 170	0 - 2850	0 - 1180	71	14 lb	Up to 45 ft.	Up to 1500 ft²
A-45-EL	200-277	50/60	0 - 1.4	0 - 175	0 - 3050	0 - 1290	71	14 lb	Up to 45 ft.	Up to 1500 ft²
A-60-P4	120	50/60	0.91/0.92	88/108	1400/1620	1443/1665	60	22 lb	Up to 60 ft.	Up to 2000 ft²
A-60-P4	230	50/60	0.57/0.66	120/150	1390/1600	1667/1902	60	22 lb	Up to 60 ft.	Up to 2000 ft²
A-60-P4	277	50/60	NA/0.68	NA/170	NA/1660	NA/2002	60	22 lb	Up to 60 ft.	Up to 2000 ft²
A-60-EC	100-130	50/60	0 - 2.2	0 - 170	0 - 1660	0 - 1825	63	22 lb	Up to 60 ft.	Up to 2000 ft²
A-60-EC	200-277	50/60	0 - 1.3	0 - 170	0 - 1630	0 - 1770	63	22 lb	Up to 60 ft.	Up to 2000 ft²
A-60-EL	100-130	50/60	0 - 2.2	0 - 170	0 - 1660	0 - 1825	63	22 lb	Up to 60 ft.	Up to 2000 ft²
A-60-EL	200-277	50/60	0 - 1.3	0 - 170	0 - 1630	0 - 1770	63	22 lb	Up to 60 ft.	Up to 2000 ft²
A-100-EC	100-130V	50/60	0 - 4.2	0 - 350	0 - 1620	0 - 3210	66	45 lb	Up to 100 ft.	Up to 2500 ft²
A-100-EC	200-277V	50/60	0 - 2.5	0 - 390	0 - 1690	0 - 3358	66	45 lb	Up to 100 ft.	Up to 2500 ft²
A-100-EL	200-277V	50/60	0 - 2.5	0 - 390	0 - 1690	0 - 3358	66	45 lb	Up to 100 ft.	Up to 2500 ft²

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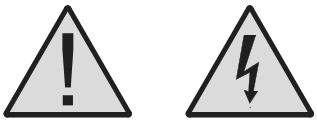
Safety Precautions - Read & Save



Warning! - To prevent fire, electrical shock or injury, please observe the following:

Electrical work must be performed by a qualified person(s) in accordance with all national and local codes/standards.

Air Pear® Thermal Equalizer® fans
Models 10, 15, 25, 45, 60, &100: all voltages

120V Models:
Supplied with a polarized/grounded plug molded to a 6 ft. (1.8 m) cord. To reduce the risk of electrical shock, this plug is intended to fit in a polarized/grounded outlet only one way. If the plug does not fit fully in the outlet, contact a qualified electrician. Do not attempt to defeat this safety feature.

230V & 277V Models:
Supplied with a 6 ft (1.8 m) cord with a 3-wire pigtail for attachment to a single phase plug rated for the correct voltage; NEMA type: L6-20P or similar, wire color code: UL/CSA: black-live/white-neutral/green-yellow-earth.

Warning! To prevent electrical shock and/or injury, unplug/disconnect unit from power source before you move unit, service unit or remove any part of housing.

Warning! To reduce the risk of fire or electrical shock, do not use models 10, 15 and 25 equipped with shaded pole motors or models 45, 60 and 100 with permanent split capacitor (P.S.C.) motors with any unapproved solid-state speed control device. Models 45, 60, 100 and 125 with electrically commutated motors (labeled as EC or EL) are capable of variable speeds with the proper controls. Contact Airius for additional information regarding variable speed controls and options.

Do not carry the Air Pear/Designer Series unit by the cord. Do not use the cord as a handle. Do not use the cord to attach or hang the product. Be sure to grasp the plug, not the cord, when disconnecting this unit from an electrical outlet.

Do not use this product if it has a damaged cord, faulty plug or any broken housing or motor component. If the supply cord, plug, motor or housing is damaged, it must be serviced or replaced by Airius, its service agents or similarly qualified persons to avoid a hazard.

To prevent damage, which may result in fire or shock hazard, do not expose this product to rain or direct moisture. Do not immerse product into water or allow water to drip into the motor housing. Do not install outdoors or in an area open to the weather. Shut off power to a wet motor at source before servicing.

Spinning blades may inflict eye or other physical injury. Always replace a damaged blade. Disconnect unit from power source first. Contact Airius for replacement blades. Plastic blades are rated 5VA, the highest fire-resistant rating for plastics, and they will not maintain a flame.

Caution! Some Air Pear products have an unguarded impeller/fan blade. Do not use in locations readily accessible to people or animals. Blades may inflict injury when moving or stationary.

To reduce the risk of injury to persons, install product so that bottom of moving fan blade or the lowest moving part is at least 8.2 ft. (2.5 m) above the floor or grade level.

The motor is thermally protected; overheating will cause the motor to stop operating. The motor may restart once normal operating temperatures are achieved. If motor fails to restart, disconnect motor from electric source and contact Airius. Do not disable this safety device or override this safety feature; doing so will void the warranty.

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Safety Precautions - Read & Save (cont.)

Do not use any PVC product (electrical tape) with the fans. If installing a fan in an environment with cutting oils in the air (production machine shop) contact the factory for assistance at 303-772-2633.

Do not position product near furnaces, fireplaces, stoves or other high temperature heat sources. Do not position Air Pear unit such that the downward air column created by the Air Pear will be directly bisected by another source of air flow, such as from another fan or from an open supply register. Do not position the unit close to other objects that will interfere with fan operation. Do not allow fan blades to come into contact with objects that can lock or inhibit the rotor operation.

Service and installation: No lubrication is required. Bearings are sealed. Bail adjustment can be made with a T-30 Torx driver/wrench, or a 5/32" Hex wrench may be used. Other tools for service: T-20 Torx (7/64" Hex) & T-25 Torx (1/8" Hex) and a #2 Phillips screwdriver.

The Air Pear unit is designed to be used with only the electrical voltage identified on the label located in the nozzle and on the bottom of the motor. Connecting to any other voltage could damage the motor and create an electrical hazard and will void warranty. If you have a question, please contact the factory.

Assembling Suspended Ceiling units: See additional instructions for kit included with this pamphlet or located in box containing kit.

Important: Install with hanging device or fastener rated for a minimum of 5x the weight of the unit. **Never use zip ties to hang the fan.** Use care when positioning the unit. To maximize performance, make sure the airflow is unobstructed into the top of the unit and the downward airflow is unobstructed and allowed to reach the floor.

Cleaning: Unplug unit from power source first to prevent electrical shock and to avoid injuries from spinning blades. Caution: Stationary blades can cause injury! You may clean the plastic housing with a warm cloth, using mild detergent only. Do not use petroleum products, thinners, solvents, ammonia, alcohols or other chemicals to clean any part of the Air Pear unit.

USA & Canada – ETL file #3164849 EU - CE

For additional information about
Air Pear® or Designer Series Thermal Equalizer® fans
and other products/accessories visit:

www.airiusfans.com

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PRE-INSTALLATION

Preparing the Work Site - Electrical Installation

ELECTRICAL WORK MUST BE PERFORMED BY A QUALIFIED PERSON(S) IN ACCORDANCE WITH ALL NATIONAL AND LOCAL CODES/STANDARDS.

Airius recommends installing a dedicated circuit only to be used with the Air Pear units. DO NOT wire the units into the lighting circuit, as the system will cycle on and off with the lights, greatly reducing the system's effectiveness.

Outlets are available in many configurations, check with the local electrical contractor to determine the preferred type for the facility. Outlets should generally be mounted vertically unless a "twist/locking" type is being used.

Refer to page 13 for plug wiring directions.
Refer to page 12 for specific model amperage.

To confirm electrical continuity, if possible, plug the Air Pear system into an energized outlet at floor level, similar to the outlet installed in the ceiling, before permanently mounting the Air Pear in the ceiling. Only energize the fan after hands/fingers or loose clothing are removed from/around the fan intake.

CAUTION − Make sure the fan voltage matches the intended power supply before installing. Connecting the fan to the wrong voltage will void warranty.

Preparing the Work Site - Mechanical Installation

A ladder, scissor lift or other suitable means of reaching the installation point will be required.

The Air Pear system is designed to hang vertically 12-to-18 inches below the ceiling of the facility with the discharge pointing to the floor for maximum thermal equalization. NOTE: The bail may be angled, as it is ratcheted for special situations where a vertical air column is undesirable and an angled column would be more effective.

Make sure the air column will have an unimpeded path from the discharge to the floor. **If using the fans in a grocery aisle application, mount the fan a minimum of 3 ft. from the edge of any open reach in case to minimize the possibility of introducing air into the case.**

The free-hanging units are designed to hang vertically and freely from the ceiling on hardware capable of supporting a minimum of five times the weight of the unit. Example - 1/4" (7 mm) diameter steel bolt is rated at a 60 lb. (27 kg.) load.

Hardware that may be used to hang the unit includes, but is not restricted to: hooks, chains, cables, carabiners, bridle rings, beam clamps and bolts. Roof structure, building construction, electrical outlets/service and accessibility will define the appropriate hardware for each installation.

If installing within a suspended ceiling, make sure there are no objects (ducts, sprinklers, conduit, etc.), for clearance purposes, directly above the proposed location of installation and relocate if necessary.

Refer to installation directions on page 16 for further information.

Refer to Suspended Ceiling Kit Assembly and Installation on page 20.

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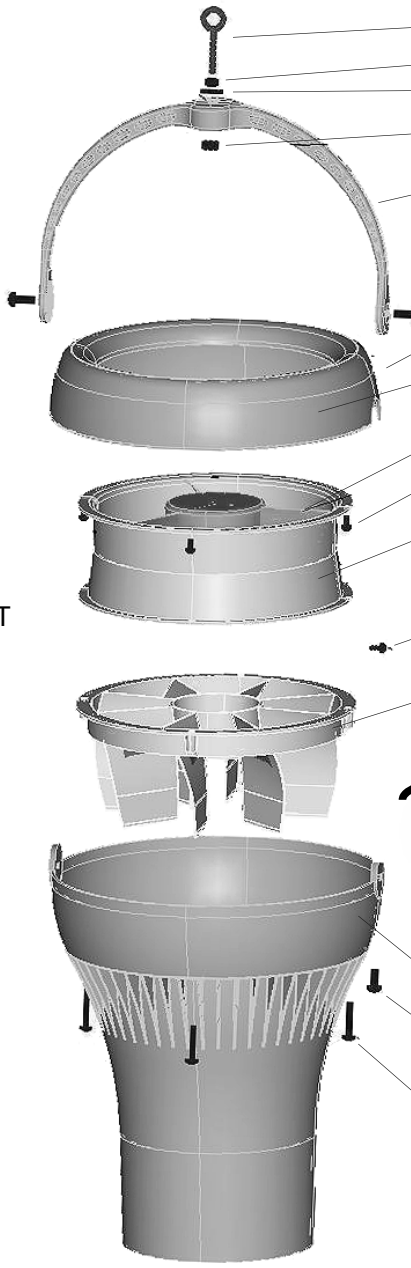
Tools Needed

T-30 Torx Driver (5/32" Hex); other tools include T-20 Torx (7/64" Hex); T-25 Torx (1/8" Hex); #2 Phillips Driver.
All necessary tools to install mounting hardware (varies from installation to installation)

Fan Diagram 10-SP, 15-SP, 25-SP

AIR PEAR 10-SP, 15-SP, 25-SP



POWER LEADS:

"N" = NEUTRAL

UNMARKED = HOT

1) 1/4 - 20 x 1 1/2 EYE BOLT
2) 1/4 - 20 NUT
3) 1/4 x 5/8 WASHER
4) 1/4 - 20 NYLOCK NUT
5) BAIL/CROSSPIECE
6) 1/4 - 20 x 1 T-30 TORX (5/32 HEX) PAN HEAD MACHINE SCREW x 2 EA.
7) HOLE FOR STRAIN RELIEF SUPPORTING POWER CORD
8) COWL (PC/ABS)
9) FAN BLADES RATED 5VA 1 EA.
10) 8 - 32 x 3/8 T-20 TORX (7/64 HEX) PAN HEAD MACHINE SCREW x 4 EA.
11) ROTOR HOUSING - FAN MOTOR 120 OR 230 VAC THERMALLY PROTECTED (277 VAC AVAILABLE)
12) 8 - 32 x 1/4 T-20 TORX (7/64 HEX) PAN HEAD GROUNDING MACHINE SCREW x 1 EA.
13) STATOR (PC/ABS)
14) STRAIN RELIEF

15) 3 WIRE 6 FT. 300 VAC RATED POWER CORD - 1 EA. (SPECIFY PLUG AND/OR VOLTAGE)
WIRE COLOR CODES:
BLACK or BROWN - HOT/ELECTRIFIED
WHITE or BLUE - "N" NEUTRAL/RETURN
GREEN or YELLOW GREEN - GROUND/EARTH

16) NOZZLE (PC/ABS)
17) 10 - 32 x 3/4 T-25 TORX (1/8 HEX) PAN HEAD LEASH ANCHOR POINT BETWEEN FINS, UNDER EDGE
18) 10 - 32 x 1 1/4 T-25 TORX (1/8 HEX) PAN HEAD MACHINE SCREW x 4 EA.

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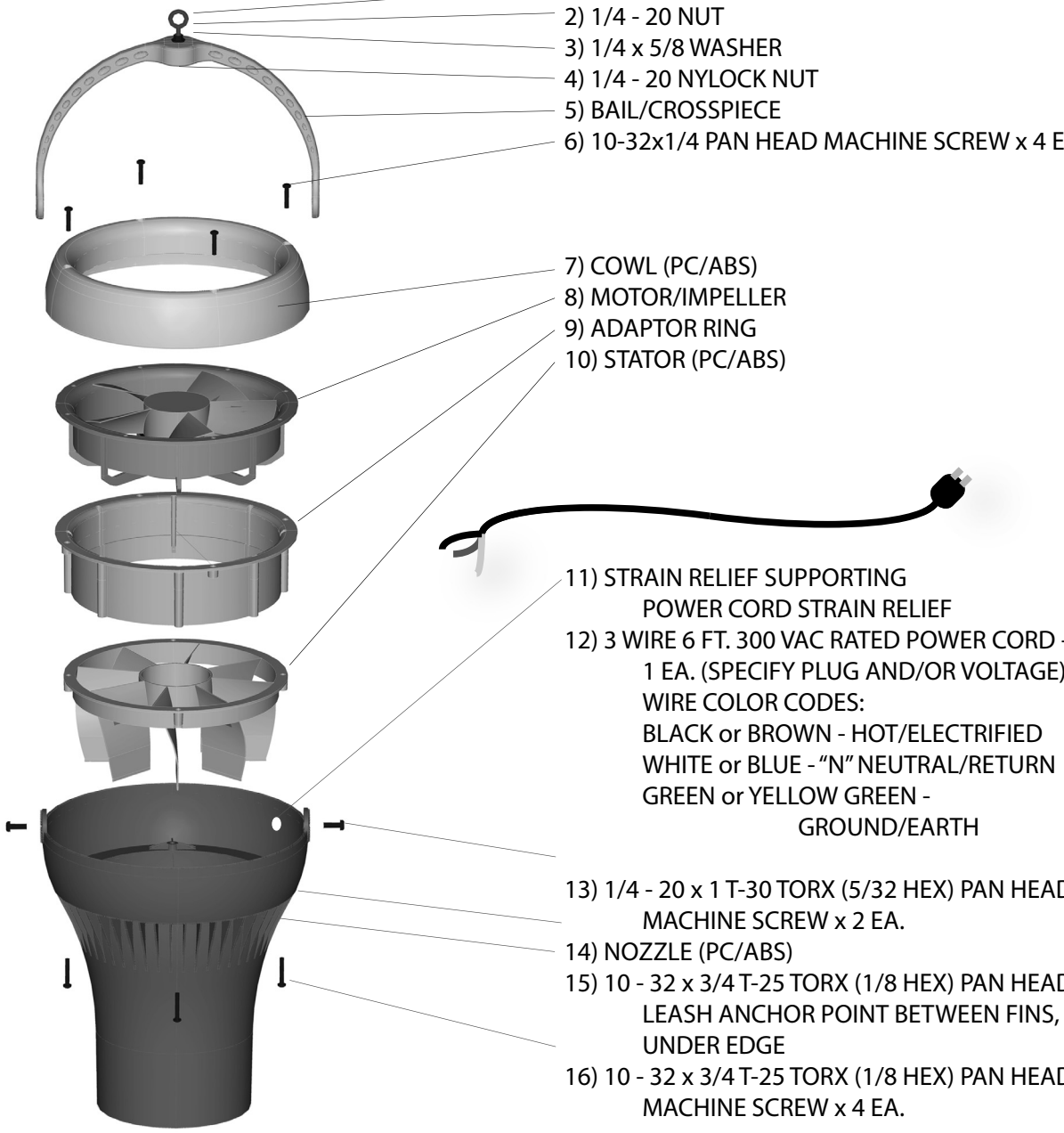
Fan Diagram 10-EC, 15-EC, 25-EC



1) 1/4 - 20 x 1 1/4 EYE BOLT
2) 1/4 - 20 NUT
3) 1/4 x 5/8 WASHER
4) 1/4 - 20 NYLOCK NUT
5) BAIL/CROSSPIECE
6) 10-32x1/4 PAN HEAD MACHINE SCREW x 4 EA.
7) COWL (PC/ABS)
8) MOTOR/IMPELLER
9) ADAPTOR RING
10) STATOR (PC/ABS)
11) STRAIN RELIEF SUPPORTING POWER CORD STRAIN RELIEF
12) 3 WIRE 6 FT. 300 VAC RATED POWER CORD - 1 EA. (SPECIFY PLUG AND/OR VOLTAGE)
WIRE COLOR CODES:
BLACK or BROWN - HOT/ELECTRIFIED
WHITE or BLUE - "N" NEUTRAL/RETURN
GREEN or YELLOW GREEN - GROUND/EARTH
13) 1/4 - 20 x 1 T-30 TORX (5/32 HEX) PAN HEAD MACHINE SCREW x 2 EA.
14) NOZZLE (PC/ABS)
15) 10 - 32 x 3/4 T-25 TORX (1/8 HEX) PAN HEAD LEASH ANCHOR POINT BETWEEN FINS, UNDER EDGE
16) 10 - 32 x 3/4 T-25 TORX (1/8 HEX) PAN HEAD MACHINE SCREW x 4 EA.

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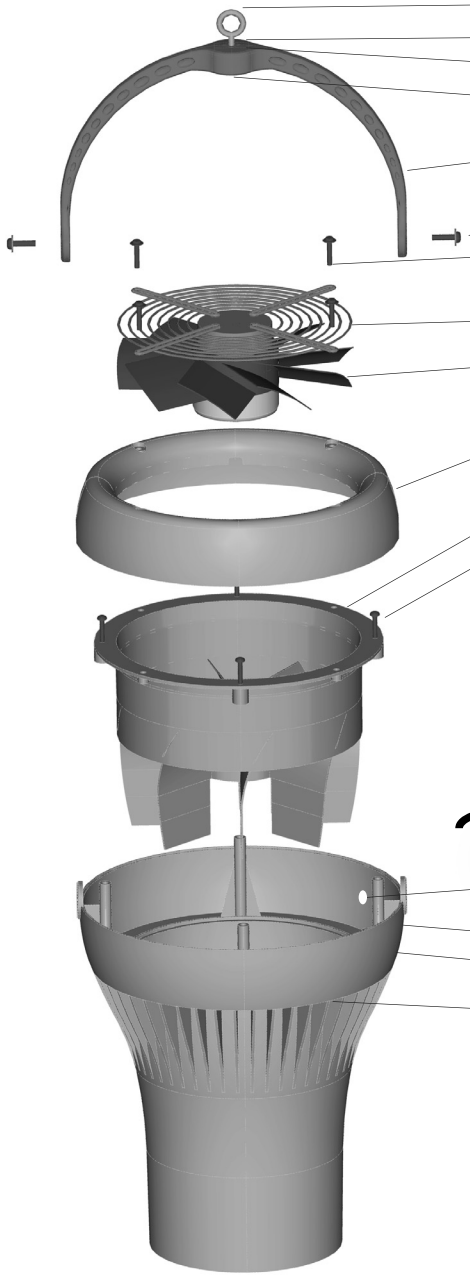
Fan Diagram 45-P4, 45-P2, 45-EC, 45-EL



1) 1/4 - 20 x 1 1/4 EYE BOLT
2) 1/4 - 20 NUT
3) 1/4 x 5/8 WASHER
4) 1/4 - 20 NYLOCK NUT
5) BAIL/CROSSPIECE
6) 1/4 - 20 x 1 T-30 TORX PAN HEAD (x2)
   #10 SAE FLAT WASHER (x2)
7) 10-32 x 2 TORX (x4)
   #10 SAE FLAT WASHER (x4)
8) STEEL GRILLE, PHOSPHATED, BLACK
9) MOTOR/IMPELLER
10) COWL (PC/ABS)
11) STATOR (PC/ABS)
12) 10-32 x 1 1/4" TORX (x4)
13) 3 WIRE 6 FT. 300 VAC RATED POWER CORD - 1 EA. (SPECIFY PLUG AND/OR VOLTAGE)
    WIRE COLOR CODES:
    BLACK or BROWN - HOT/ELECTRIFIED
    WHITE or BLUE - "N" NEUTRAL/RETURN
    GREEN or YELLOW GREEN - GROUND/EARTH
14) HOLE FOR STRAIN RELIEF SUPPORTING POWER CORD
15) HOLE FOR CONTROL WIRES w/ GROMMET
16) NOZZLE (PC/ABS)
17) 10 - 32 x 3/4 T-25 TORX (1/8 HEX) PAN HEAD LEASH ANCHOR POINT BETWEEN FINS, UNDER EDGE

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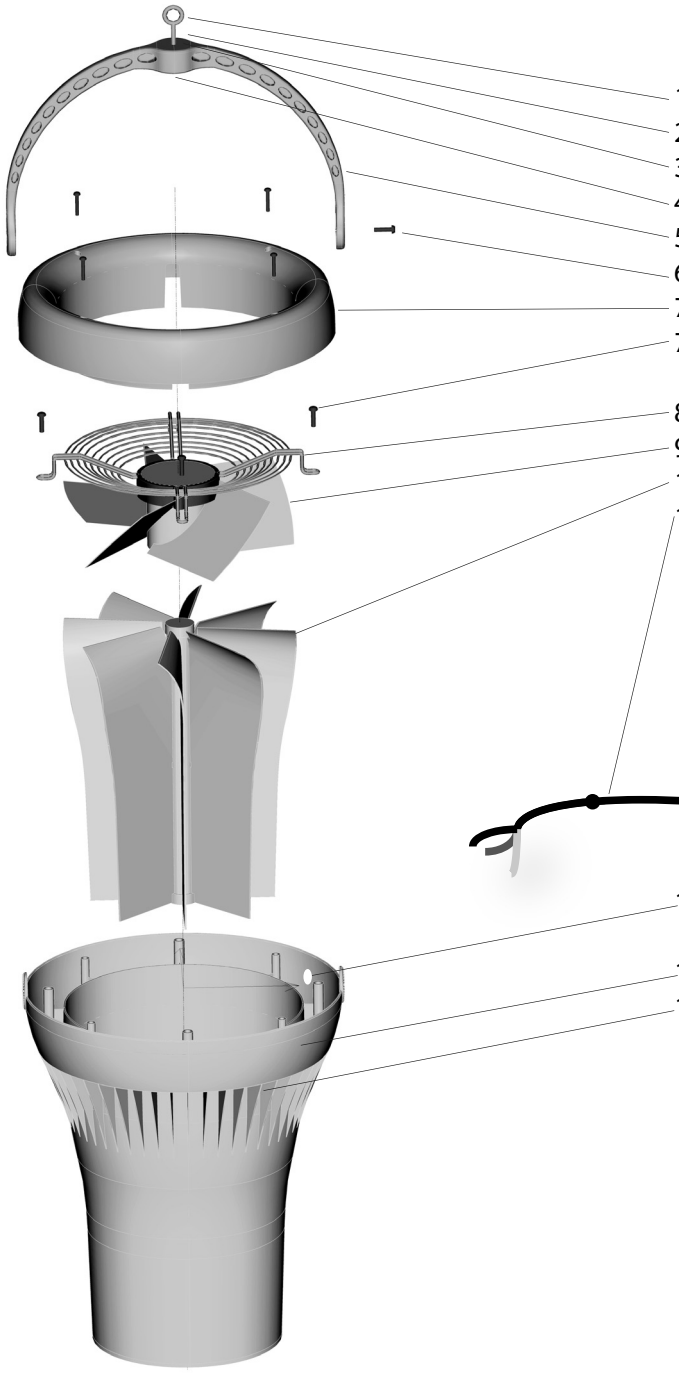
Fan Diagram 60-P4, 60-EC, 60-EL



1) 1/4 - 20 x 1 1/4 EYE BOLT
2) 1/4 - 20 NUT
3) 1/4 x 5/8 WASHER
4) 1/4 - 20 NYLOCK NUT
5) BAIL/CROSSPIECE
6) 1/4 - 20 x 1 T-30 TORX PAN HEAD (x2)
7) FAN HOUSING (PC/ABS)
7) 1/4 - 20 x 1 (x4)
#12 SAE FLAT WASHER (x4)
8) STEEL GRILLE, PHOSPHATED, BLACK
9) MOTOR/IMPELLER
10) STATOR (PC/ABS)
11) 3 WIRE 6 FT. 300 VAC RATED POWER CORD - 1 EA. (SPECIFY PLUG AND/OR VOLTAGE)
WIRE COLOR CODES:
BLACK or BROWN - HOT/ELECTRIFIED
WHITE or BLUE - "N" NEUTRAL/RETURN
GREEN or YELLOW GREEN - GROUND/EARTH

12) HOLE FOR STRAIN RELIEF SUPPORTING POWER CORD
13) NOZZLE (PC/ABS)
14) 10 - 32 x 3/4 T-25 TORX (1/8 HEX) SLOT HEAD LEASH ANCHOR POINT BETWEEN FINS, UNDER EDGE

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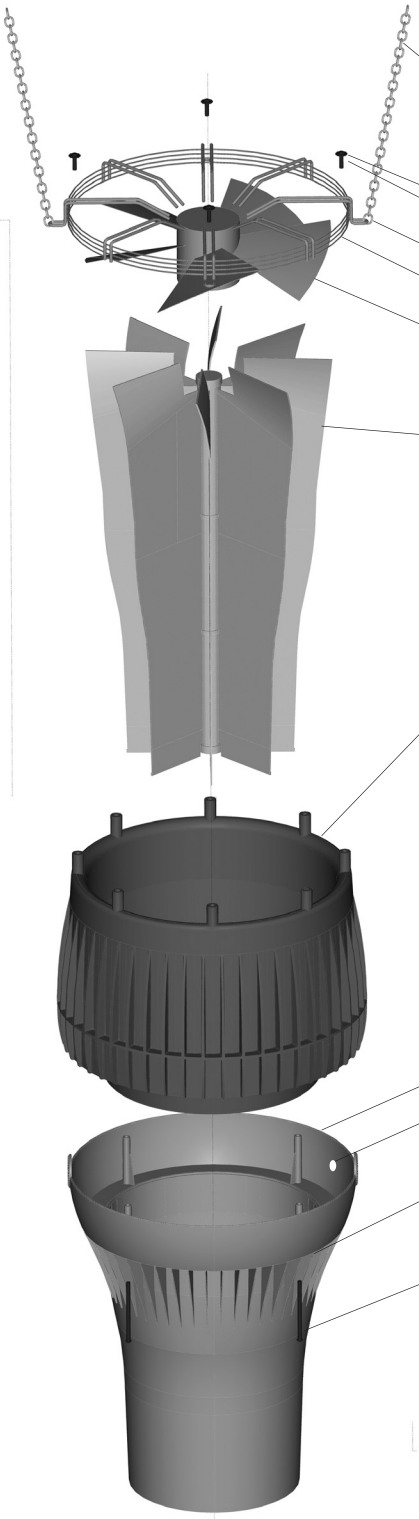
Fan Diagram 100-EC, 100-EL



1) SUSPENSION CHAIN
2) 1/4 - 20 x 1
3) 1/4 x 7/8 WASHER
4) 3/16 x 1 7/8 QUICKLINK
5) STEEL GRILLE, PHOSPHATED, BLACK
6) MOTOR/IMPELLER
7) STATOR (ABS)
8) COWL (PC/ABS)
9) 3 WIRE 6 FT. 300 VAC RATED POWER CORD - 1 EA. (SPECIFY PLUG AND/OR VOLTAGE)
   WIRE COLOR CODES:
   BLACK or BROWN - HOT/ELECTRIFIED
   WHITE or BLUE - "N" NEUTRAL/RETURN
   GREEN or YELLOW GREEN - GROUND/EARTH

10) NOZZLE (PC/ABS)
11) HOLE FOR STRAIN RELIEF SUPPORTING POWER CORD
12) 10 - 32 x 3/4 T-25 TORX (1/8 HEX) PAN HEAD LEASH ANCHOR POINT BETWEEN FINS, UNDER EDGE
13) 1/4 - 20 x 4 T-30 TORX PAN HEAD (x4)
    #12 SAE FLAT WASHER (x4)

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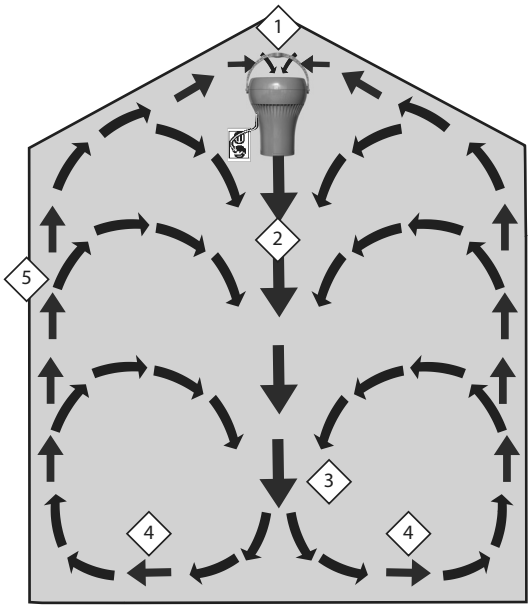
Understanding Air Pear's Unique Air Flow



1. Low Velocity Intake - Low intake speed does not disturb air boundary layer under roof deck.
2. Columnar Laminar Flow - Removing the rotational component induced by the axial fan allows for the air to move in a straight, ductless column from the ceiling to the floor.
3. Entrainment - The column acts on the surrounding dead pool of air to induce entrainment and effectively multiply the air delivered to the floor.
4. Radial Spread - Once the column hits the floor, the air spreads radially until it loses velocity and migrates toward the ceiling.
5. Torus - The combination of these effects creates a torus-type air circulation and mixing pattern that effectively and efficiently achieves thermal equalization and general air movement.

Determine the number of fans, model and amperage to facilitate in the branch circuit design. Only qualified person(s) may determine the proper branch sizing and facilitate installation. If you have questions, contact your local electrical contractor.

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INSTALLATION

Power Requirements

Model Amperage 120VAC, single phase, 50/60 Hz:

Air Pear 10-SP: 0.11 / 0.13 A
Air Pear 15-SP: 0.11 / 0.14 A
Air Pear 25-SP: 0.30 / 0.32 A
Air Pear 45-P4: 0.40 / 0.41 A
Air Pear 45-P2: 1.05 / 1.48 A
Air Pear 60-P4: 0.91 / 0.92 A

Model Amperage 100-130VAC, single phase, 50/60 Hz:

Air Pear 10-EC: 0.12 A
Air Pear 15-EC: 0.17 A
Air Pear 25-EC: 0.4 A
Air Pear 45-EC: 2.2 A
Air Pear 45-EL: 2.2 A
Air Pear 60-EC: 2.2 A
Air Pear 60-EL: 2.2 A
Air Pear 100-EC: 4.2 A

Model Amperage 230VAC, single phase, 50/60 Hz:

Air Pear 10-SP: 0.06 / 0.06 A
Air Pear 15-SP: 0.06 / 0.07 A
Air Pear 25-SP: 0.14 / 0.13 A
Air Pear 45-P4: 0.19 / 0.2 A
Air Pear 45-P2: 0.54 / 0.7 A
Air Pear 60-P4: 0.57 / 0.66 A

Model Amperage 200-250VAC, single phase, 50/60 Hz:

Air Pear 10-EC: 0.06 A
Air Pear 15-EC: 0.08 A
Air Pear 25-EC: 0.26 A

Model Amperage 277VAC, single phase, 60 Hz:

Air Pear 25-SP: 0.14 A
Air Pear 45-P4: 0.2 A
Air Pear 45-P2: 0.7 A
Air Pear 60-P4: 0.68 A

Model Amperage 200-277VAC, single phase, 50/60 Hz:

Air Pear 45-EC: 1.4 A
Air Pear 45-EL: 1.4 A
Air Pear 60-EC: 1.3 A
Air Pear 60-EL: 1.3 A
Air Pear 100-EC: 2.5 A
Air Pear 100-EL: 2.5 A

Branch Circuit Protection

The Air Pear fans do not include fuses for branch circuit protection. The branch circuit must have a dedicated circuit breaker or similar device. National and local safety standards and electrical codes may determine additional requirements for installation.

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Plug Wiring (230/277VAC Models)

120VAC cord is supplied with a molded three-prong polarized/grounded plug. DO NOT DEFEAT this SAFETY DEVICE or modify the plug in any way.

230/277VAC no plug supplied. When fitting a plug always ensure that all relevant local regulations/electrical codes are understood and followed with care - if in any doubt seek expert guidance.

The power cord is a three-wire 18 AWG (or 16 AWG) 300VAC rated electrical cord UL rated in North America (NA) as SJT or for CE/EU compliance rated as HO5VV.

The three wires in the power cord are color-coded to ensure proper wiring as follows:

BLACK or BROWN = HOT/ELECTRIFIED/LIVE
WHITE or BLUE = “N” NEUTRAL/RETURN PATH
GREEN or YELLOW-GREEN = GROUND/EARTH

The cord is attached to the fan motor via two power leads with insulated 1/4” quick connects.

The cord is secured in the housing by a strain relief and knotted inside the housing for additional security.

Procedure for wiring the plug in a single-phase electrical system:

Use CAUTION when wiring/attaching the plug (Male Connector) to the Air Pear/Designer Series system or when using any electrical device.

1. Plug should be rated for 230VAC or 277VAC and fit properly into outlet (female connector) being used for power.

2. To avoid electrical shock, DO NOT plug device into energized outlet until all exposed wires and connecting terminals are enclosed by plug housing. See plug manufacturer’s instructions.

3. Locate the three stripped wires on the 300VAC rated power cord attached to the unit where the outer cord insulation jacket has been removed. Wires are coded as follows: black or brown is HOT/Live (the energized conductor), white or blue is neutral “N” (the conductor used for a return current path) and green or yellow/green is ground/earth (the conductor to connect to the earth).

4. Using the plug manufacturer’s instructions, locate the proper positions to attach the color-coded wire to the color-coded or otherwise appropriately labeled terminals on the plug.

5. Tighten all connections. Reassemble plug in accordance with plug manufacturer’s instructions.

To confirm electrical continuity, if possible, plug the Air Pear system into an energized outlet on the ground, similar to the outlet installed in the ceiling, before permanently mounting.

NOTE: The Air Pear System can be wired directly to a junction box but only by a qualified electrician or similarly qualified person. Always ensure that all relevant local regulations/electrical codes are understood and followed with care - if in any doubt seek expert guidance. Check local electrical codes. The preferred system is designed with a plug for easy service and cleaning. An on-off switch must be installed in the circuit to be able to disable the power to prevent electrical hazard when servicing the appliance.

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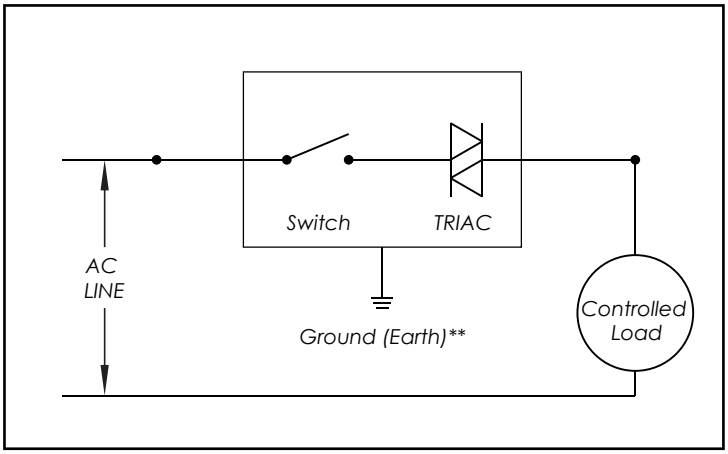
Speed Control Wiring (Model 10-SP, 15-SP, 25-SP, 45-P2, 45-P4 & 60-P4)

SAFETY WARNING!

Unit should be installed by a qualified electrician in accordance with the National Electrical Code and other local codes that may apply. This control must be grounded when installed. Failure to follow these instructions may result in electrical shock or a fire hazard. This control is suitable for mounting in a metal or approved enclosure. These controls must not be used for loads exceeding those ratings clearly marked on the device.

CONNECTION DIAGRAM FOR 2-WIRE CONTROLS



APPLICATION

- Motor Type - Shaded Pole, PSC and Universal.
- Required Load - Fans and speed dependant loads.

WIRING

- Warning! - Power must be turned off before wiring. Connect control in series with motor and line voltage - never connect control across line.

MOUNTING

- Use 2” deep standard electrical box.
- Secure control with outer bracket tabs.

MINIMUM SPEED ADJUSTMENT

- Motor must be in actual operating conditions to achieve proper speed adjustment. (Motor will not slow down unless proper load is applied.)
- Turn main control knob clockwise to lowest speed position.
- Locate and adjust minimum speed setting on front plate with screw driver (rotate clockwise to decrease minimum speed; counter-clockwise to increase minimum speed.)
- Note: For all high-current models, 8 amps or greater, the opposite minimum speed rotation adjustment must be made so that motor runs with sufficient torque to prevent stalling.
- Motor will now operate from this preset minimum speed to full speed.

FINAL MOUNTING

- Install front dial plate - remove protective plastic.
- Turn main control until switch snaps off.
- Push on knob so that pointer is off position.

NOTE: For no switch models install front dial plate and push on knob.

TRIAC SIZING CONSIDERATIONS

- ** Some models do not require grounding. Therefore, a ground wire is not provided.
- Make sure the total circuit amperage load does not exceed the TRIAC’s rated amperage.
- Make sure TRIAC’s voltage rating matches line voltage.

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2-Speed Control Wiring (Model 10-EC, 15-EC and 25-EC only)

SAFETY WARNING!

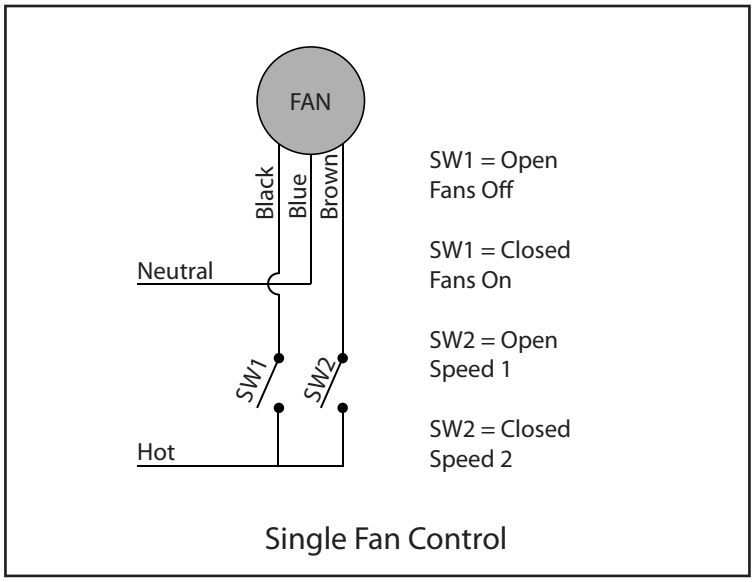
Unit should be installed by a qualified electrician in accordance with the National Electrical Code and other local codes that may apply.

APPLICATION

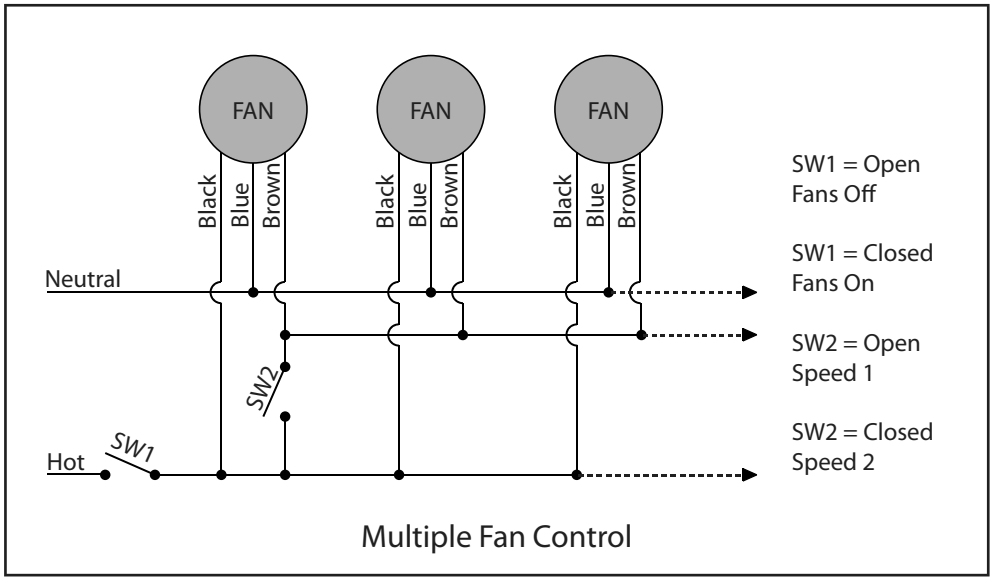
• Motor Type - Electronically Commutated, 2-speed control. The 2 speeds are factory set. Do not use this wiring method if you have the optional 0-10VDC control module or a shaded pole motor.

WIRING

• Warning! - Power must be turned off before wiring.



Single Fan Control



Multiple Fan Control

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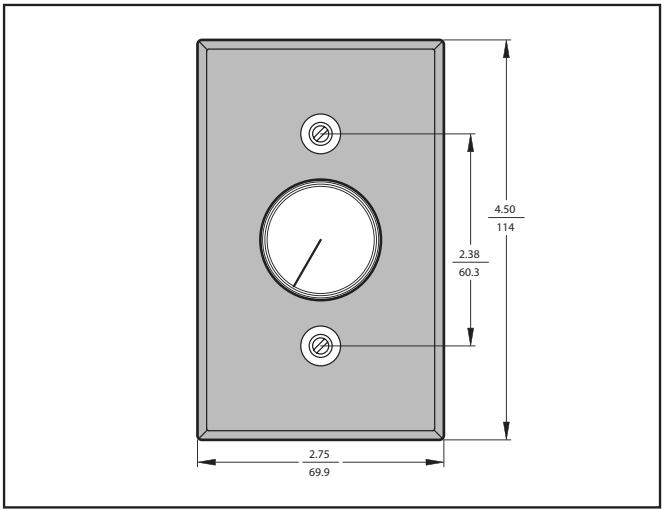
Speed Control Wiring (10-EC, 15-EC & 25-EC with optional 0-10VDC module. Model 45-EC, 60-EC & 100-EC)

POTENTIOMETER SPEED CONTROL DESCRIPTION

Multi-turn wirewound potentiometer used to vary the speed of electrically commutated (EC) motors. Speed controls for shaded pole or PSC motors: refer to page 14. Speed control for EL fans: refer to seperate FanCenter installation & operation guide.

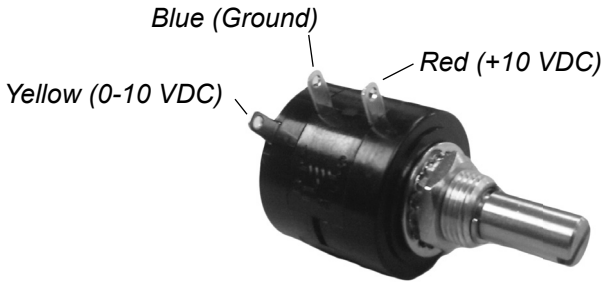
MODEL	VALUE (Ω)	LINEARITY	TOLERANCE
POT-1	10K	±0.25%	±5%

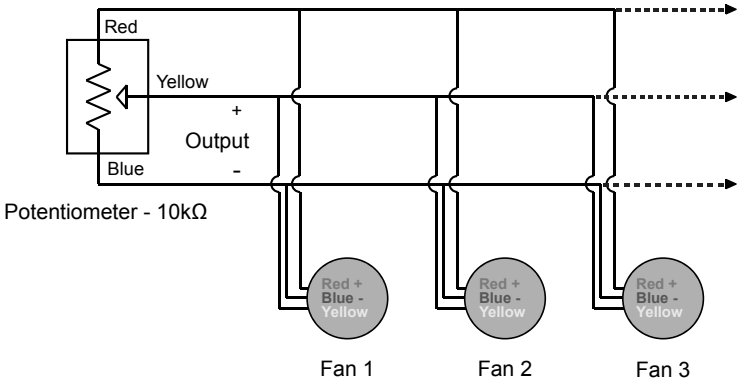


GENERAL NOTES

- The fan is supplied with current via the DC output and supplies a 0-10VDC signal that allows infinitely variable open loop speed control.
- If control wire exceeds 1300 ft. refer to Potentiometer wiring (external power source).
- A single controller can be used to control multiple fans with the same speed setting.
- Connecting the red and yellow leads will allow EC fans to operate at full speed.
- Wire runs up to 1000 feet (305 m) can be made using 20 - 24 AWG control wire. Wire runs longer than 1000 ft. will require the addition of a 10 - 12VDC power supply (not included).

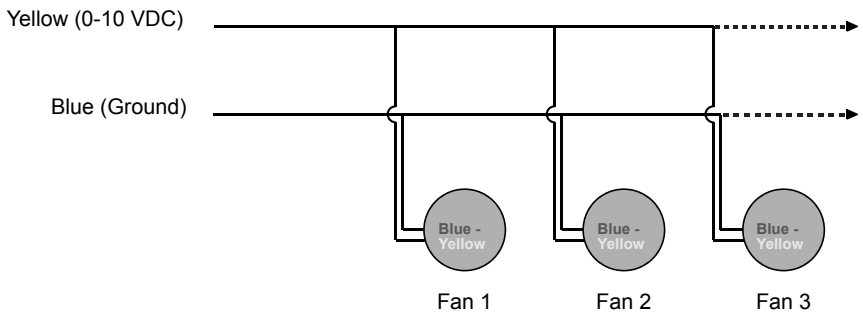
Potentiometer Control Wiring





BAS Control Wiring

The BAS should be capable of generating a 0-10VDC signal to modulate the fan speed. Use the following wiring diagram if this is the preffered connection type.



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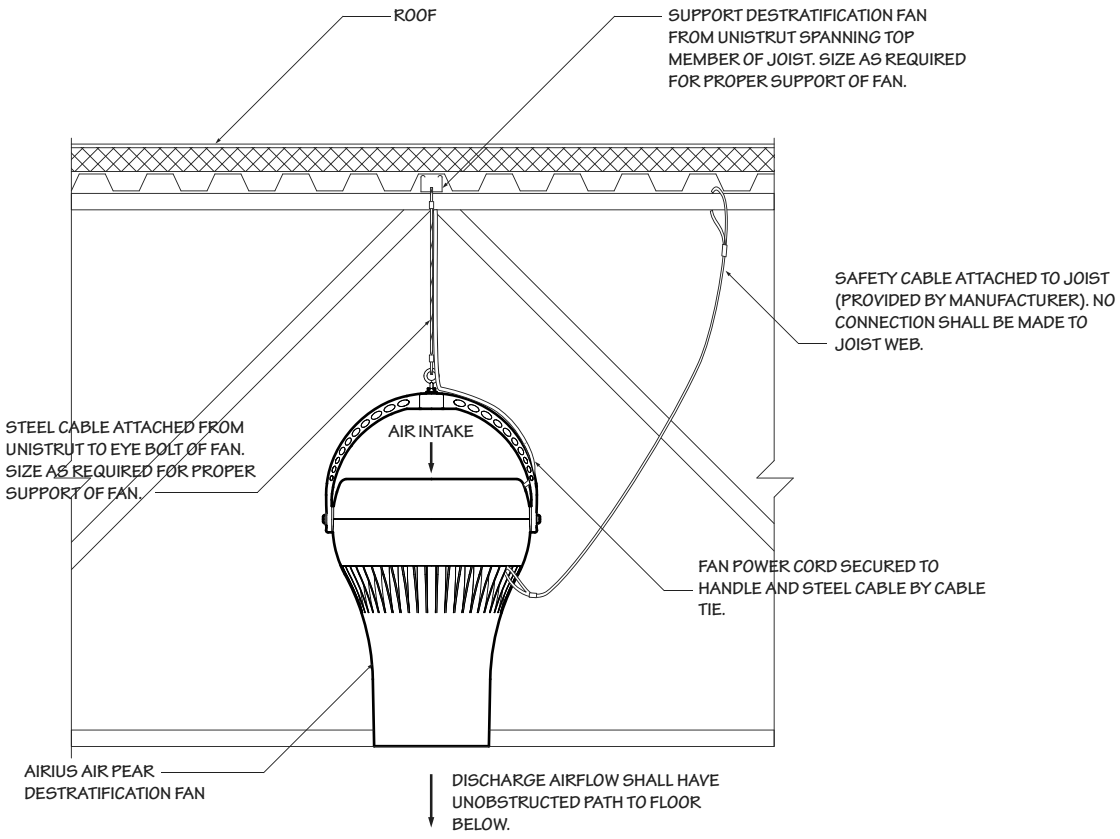
Free-Hanging Air Pear Suggested Installation Methods

Hardware that may be used to hang the unit includes, but is not restricted to: Hooks, chains, cables, carabiners, bridle rings, beam clamps and bolts. Roof structure, building construction and accessibility will define the appropriate hardware for each installation. Mount the fan as high in the ceiling as possible and do not restrict airflow into the intake.

After ensuring the Air Pear system is firmly attached and after REMOVING YOUR HANDS FROM THE UNIT, ONLY THEN is it safe to plug the unit into the power source using the approved plug to confirm function and electrical continuity.

NOTE: Secure the power cord to the ceiling structure as added security. The cord will act as a safety leash and by securing it the possibility of the plug accidentally coming out of the outlet is greatly reduced. A 50 lb. (20 kg.) rated Zip Tie or several wraps of mechanics wire are examples of methods of securing the power cord.

The following graphic is an example of hanging the typical Air Pear unit:



DESTRATIFICATION FAN DETAIL

SCALE: NONE

NOTES:

1. INSTALL FAN AS CLOSE AS POSSIBLE TO CEILING. (TYP 0'-6" TO 2'-0")
2. OPTIONAL HANGING METHODS INCLUDE: BEAM CLAMP/BRIDLE RING, CHAIN LINK/CARABINER, THREADED ROD/LOCK NUTS, ETC...
3. CONTRACTOR TO PROVIDE POWER FEED IN CONDUIT. THE ELECTRICAL CONNECTION CAN BE MADE IN A J-BOX (HARD WIRED) OR PLUG CONNECTION (J-BOX/RECEPTACLE).

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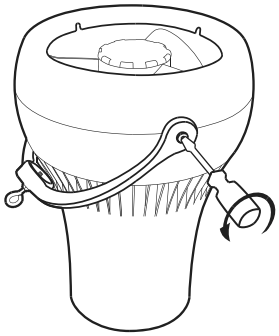
Suggested Installation Methods

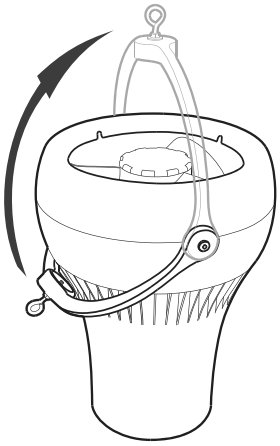
1

Remove the Air Pear from its box, then remove the plastic protective bag. The bail (handle) is attached via two Torx screws. Using T-30 Torx driver, loosen these screws enough so the bail may swing.



2

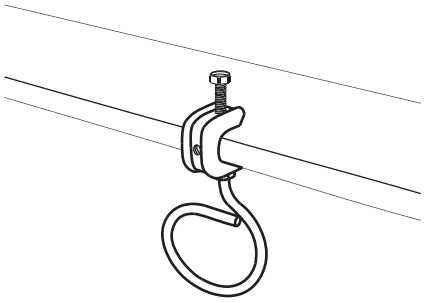
Swing the bail to the vertical position and re-tighten the two Torx screws.



3

The Air Pear system is designed to hang vertically and freely 12-to-18 inches, or as close as possible, from the ceiling on professionally installed hardware, for models 10/15/25, capable of supporting a minimum of five times the weight of the Air Pear unit, 60 lb. (27 kg.). Example - 1/4” (7 mm) diameter steel bolt is rated at 60 lb. (27 kg.) load.

A feature of the Air Pear system is its flexibility. Hardware that may be used to hang the unit includes, but is not restricted to: Hooks, chains, cables, carabiners, bridle rings, beam clamps and bolts. Roof structure, building construction and accessibility will define the appropriate hardware for each installation.



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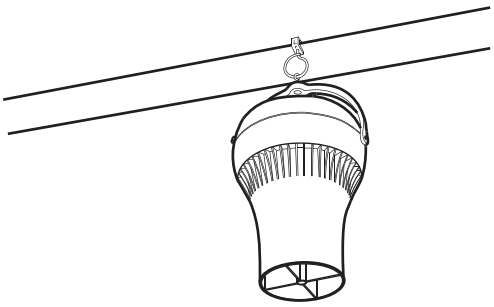
Suggested Installation Methods

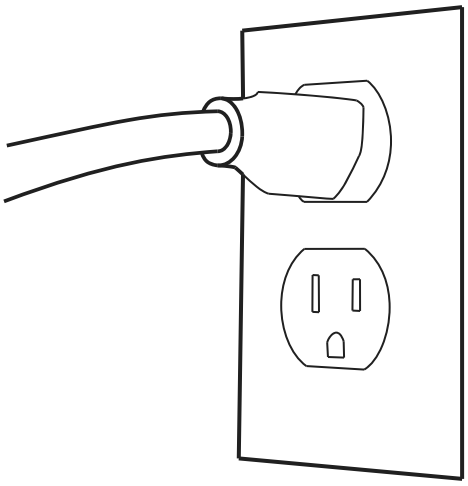
4

After ensuring the Air Pear system is firmly attached, remove your hands from the unit.



5

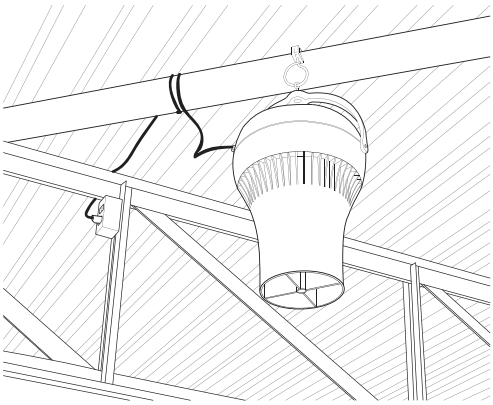
It is then safe to plug the unit into the power source using the approved plug to confirm function and electrical continuity.



6

NOTE: SECURE the power cord to the ceiling structure as added security. The cord will act as a safety leash and by securing it the possibility of the plug accidentally coming out of the outlet in the future is greatly reduced. A 50 lb. (20 kg.) rated Zip-Tie or mechanics wire are examples of methods of securing the power cord.

The graphic to the right is an example of hanging the Air Pear unit:



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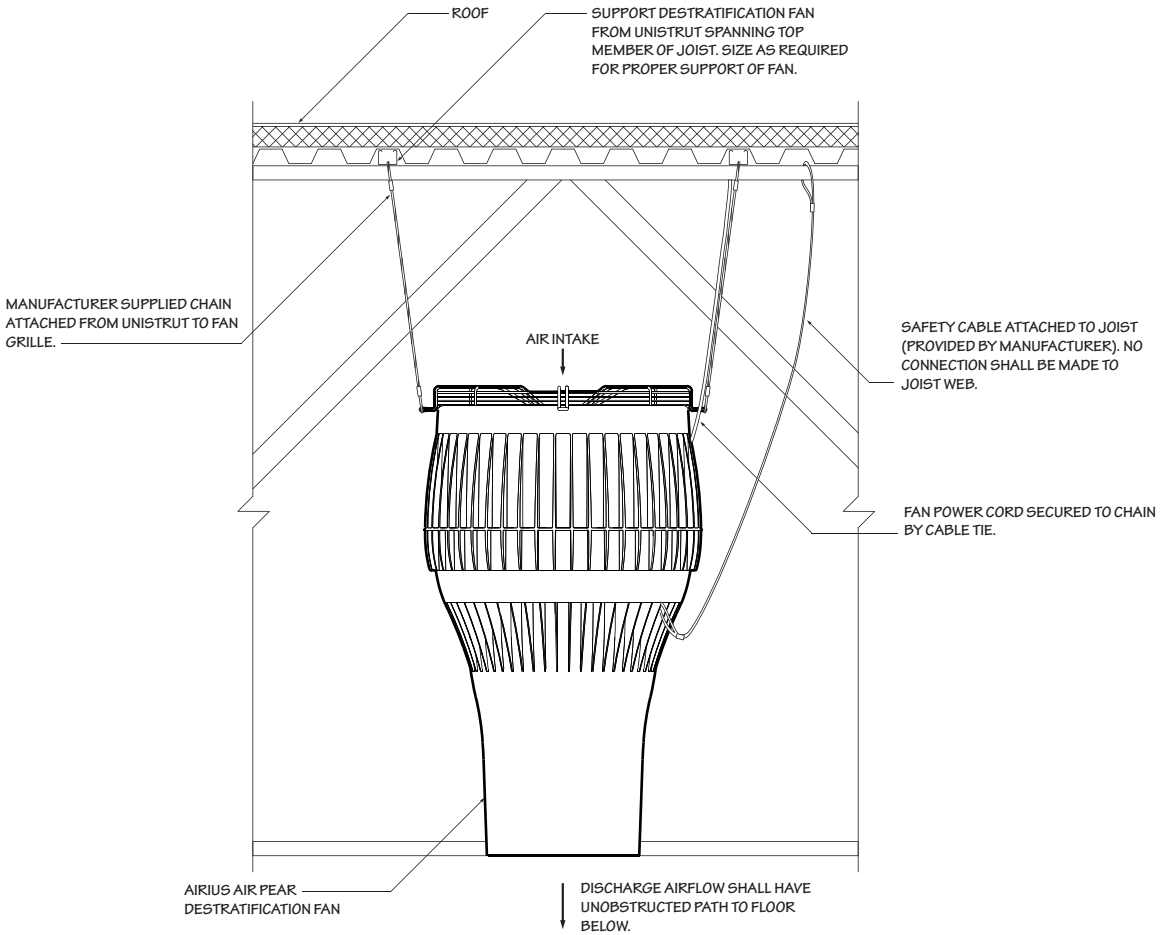
Free-Hanging Air Pear 100 Suggested Installation Method

200 lbs rated chains are supplied with the Model 100 fans that attach to the unit and the structure above. Roof structure, building construction and accessibility will define the appropriate connection hardware for each installation. Do not fasten units to joist web members or joist bridging.

After ensuring the Air Pear system is firmly attached and after REMOVING YOUR HANDS FROM THE UNIT, ONLY THEN is it safe to plug the unit into the power source using the approved plug to confirm function and electrical continuity.

NOTE: Secure the power cord to the ceiling structure as added security. The cord will act as a safety leash and by securing it the possibility of the plug accidentally coming out of the outlet is greatly reduced. A 50 lb. (20 kg.) rated Zip Tie or several wraps of mechanics wire are examples of methods of securing the power cord.

The following graphic is an example of hanging the Air Pear Model 100:



DESTRATIFICATION FAN DETAIL

SCALE: NONE

NOTES:
1. INSTALL FAN CLOSE TO CEILING. (TYP 1'-6" TO 3'-0")
2. CONTRACTOR TO PROVIDE POWER FEED IN CONDUIT. THE ELECTRICAL CONNECTION CAN BE MADE IN A J-BOX (HARD WIRED) OR PLUG CONNECTION (J-BOX/RECEPTACLE).
3. THE THIRD MANUFACTURER SUPPLIED CHAIN CAN BE USED TO TILT THE FAN AT AN ANGLE.

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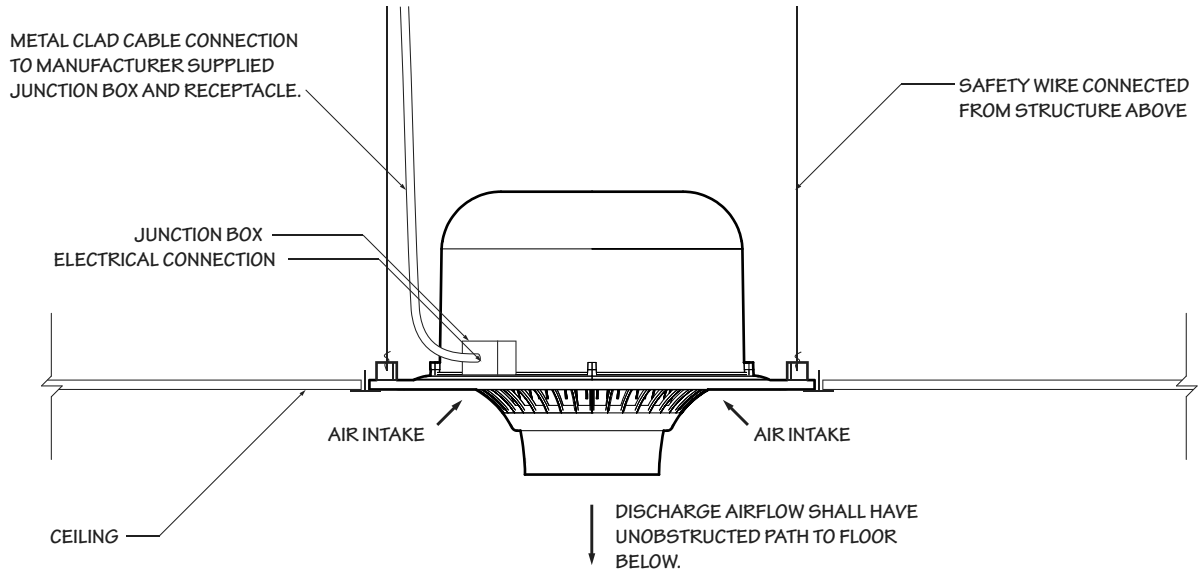
Suspended Ceiling Air Pear Suggested Installation Methods

After ensuring the Air Pear system is firmly attached and after REMOVING YOUR HANDS FROM THE UNIT, ONLY THEN is it safe to plug the unit into the power source using the approved plug to confirm function and electrical continuity.

NOTE: Drill each of the four right angle corner tabs and secure the faceplate to the structure above with mechanics wire.

The following graphic is an example of hanging the typical Suspended Ceiling Air Pear unit:



DESTRATIFICATION FAN DETAIL

SCALE: NONE

NOTES:

1. CONTRACTOR SHALL INSTALL METAL CLAD CABLE TO MANUFACTURER SUPPLIED JUNCTION BOX AND RECEPTACLE.

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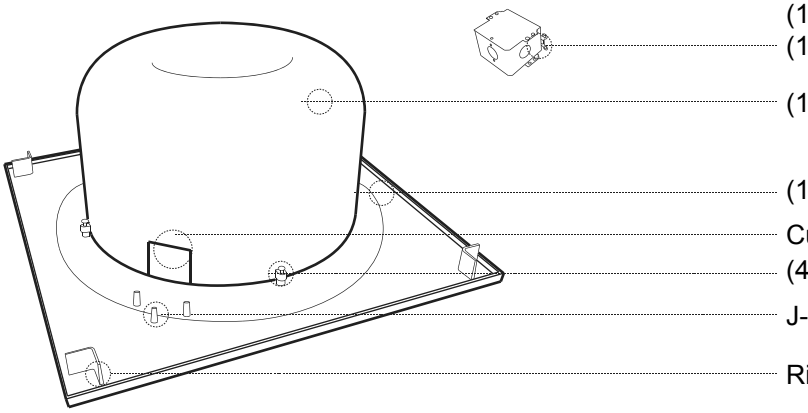
Suspended Ceiling Air Pear Assembly & Installation

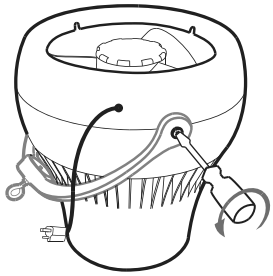


(1) J-box and (1) Faceplate
(1) 120V, 230V or 277V Receptacle, (2) Thumb Screws*
(1) Dome
(1) Air Intake Grille
Cutout for Power Cord/Receptacle
(4) Phillips Screws*
J-box Mounting Location
Right Angle Tabs

*Included in hardware bag

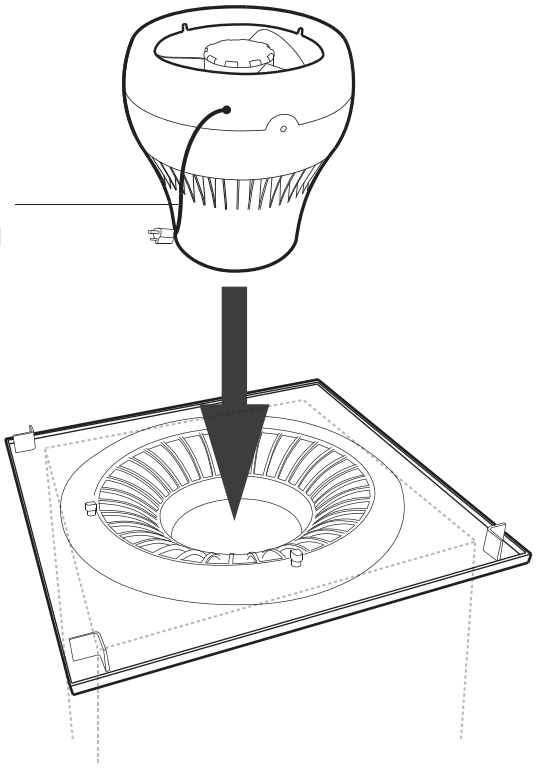
1

Remove the Air Pear from its box and plastic protective bag. The bail (handle) is attached via two Torx screws. Loosen these screws and remove the bail (discard at your discretion).



2

Remove all components from packing materials. Using the box that the suspended ceiling kit unit arrived in, open end up, place the 2’ x 2’ flat air intake grille over the open end of the box, face down. The right angle corner tabs should be facing up. Insert the Air Pear unit (with bail removed) into the center hole so that the nozzle extends below the air intake grille and the cord is hanging over the edge.



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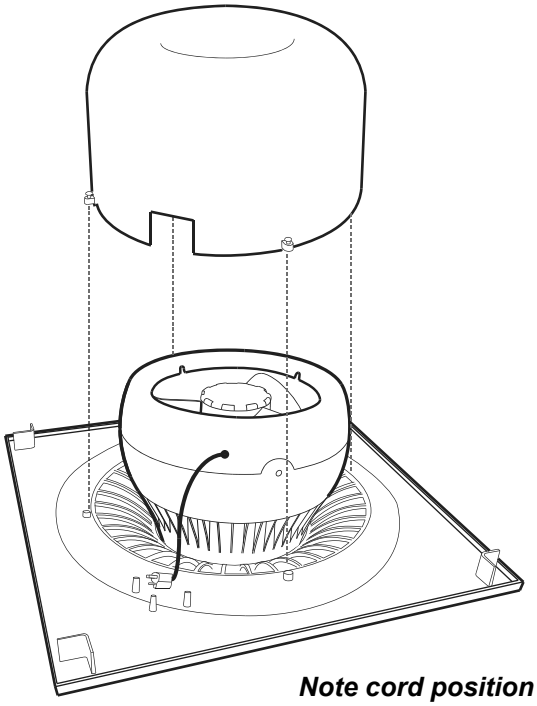
Suspended Ceiling Kit Assembly & Installation (cont.)

3

Place dome over Air Pear unit and align it with screw holes. Note that cutout should face the j-box mounting location. Dome should seat into the rim designed for it on the base, if necessary gently push the dome edge in until it seats inboard of the rim.

Insert the four Phillips screws (10-32 x 5/8” provided) through ears in dome and into threaded brass inserts. Screws will go in easily when aligned properly. Do not overtighten, as galling or stripping could occur.

When dome is installed, the power cord needs to be fed through the cutout in the dome.



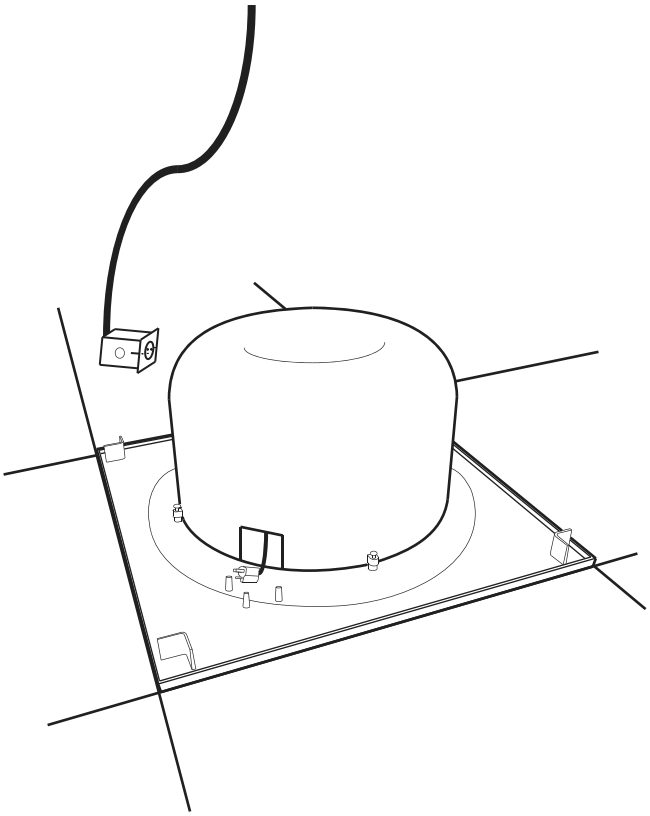
Note cord position

4

Have an electrician or similarly qualified person wire, with MC-type cable, the supplied receptacle into the j-box in close proximity to the intended installation location. Fasten the supplied metal faceplate to the j-box. Follow all local and national electric codes. MC cable should have enough length to ensure easy installation.

5

Place the assembled suspended ceiling kit into the T-bar grid. The air intake grille is designed to replace a 2’ x 2’ ceiling tile. If replacing a 2’ x 4’ tile, please use an additional piece of 2 ft. T-bar suspension material to finish the edge and provide additional strength and rigidity to the existing suspension system.



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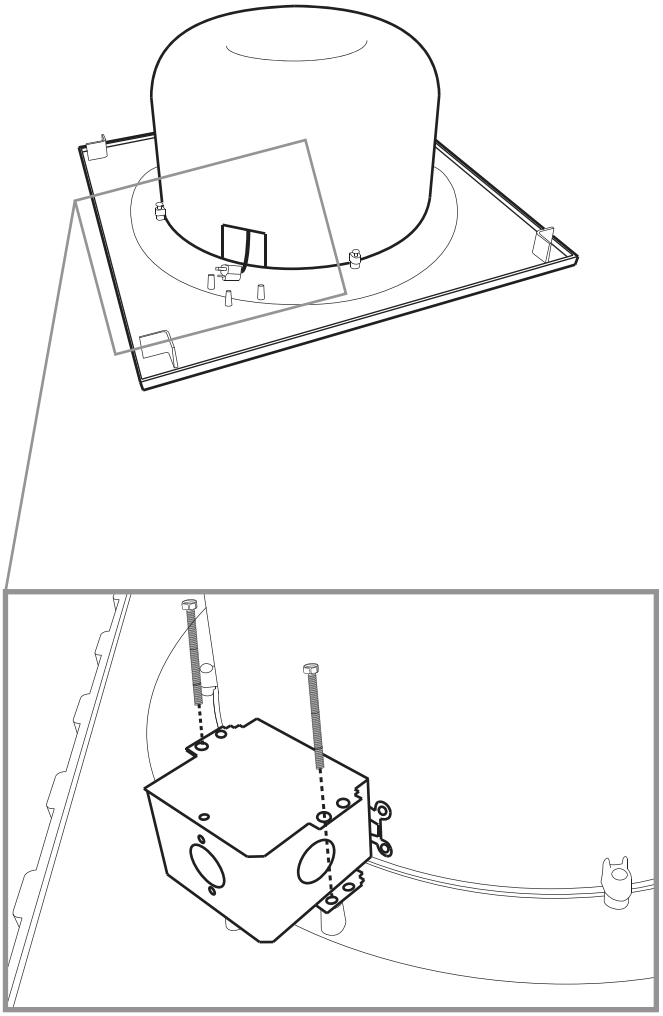
Suspended Ceiling Air Pear Assembly & Installation (cont.)

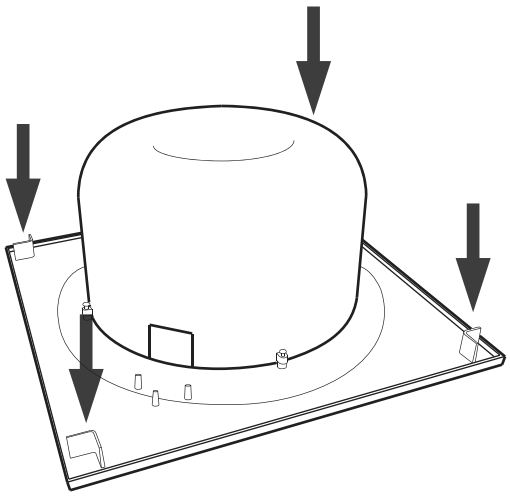
6

Plug the Air Pear power cord into the receptacle. Using the supplied thumbscrews, fasten the j-box to the air intake grill through the indicated holes as shown (wiring to j-box omitted for clarity).



7

The base has four right angle tabs located at each corner that can be drilled for additional ceiling/support wires to be added if desired.



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OPERATING THE FAN

Heating Season

Within an enclosed building space, with minimal air movement, hot lighter air rises to the ceiling while cold heavier air falls to the floor creating a temperature gradient. This condition will cause excess energy use as the HVAC system fights to maintain the thermostat set point typically at 5 ft. above floor level. This inefficient condition can also cause great thermal discomfort for the building occupants.

The Air Pear is an energy-efficient air turbine, designed to continuously move a column of air to the floor. A typical Air Pear installation includes a series of units mounted just below the ceiling, evenly spaced throughout a facility, working in concert to balance the air temperature ceiling to floor and wall to wall.

As air circulation improves and air temperatures balance, your HVAC system will require less and less energy to comfortably heat the work area, reducing the energy consumption of HVAC systems up to 35% or more. Once started, the entire process of “thermal equalization” will take, on average, less than 24 hours.

All Air Pear fans are designed to run continuously, year-round, to maintain thermal equalization and general air movement.

Cooling Season

We tend to think stratification occurs only in the heating season, but actually the condition exists year round. As you mechanically condition the air to combat rising outdoor temperatures, combined with minimal air movement, a large temperature gradient can exist.

The HVAC system will consume more energy as it fights the temperature gradient, hot and cold spots and short cycling compared to a properly mixed space. Using the Air Pear system will help alleviate the problem through thermal equalization. Keeping the thermostats satisfied longer and creating air movement that produces a cooling effect on the skin will result in the ability to raise the thermostat set points as much as 6° F, yielding up to an 18% energy savings during cooling seasons.

In non-air conditioned spaces, the Air Pear system can be used for spot cooling and general air circulation. If a large temperature differential exists between day and night, a strategy of drawing cool night air into the space and closing openings during the day can help maintain a cooler temperature internally as outdoor air temperatures rise.

A person’s head is most sensitive to comfort perception. Hot air trapped in the ceiling warms all the surrounding duct work, decking and other ceiling-mounted equipment to act as a radiant heat source and can cause the occupants to perceive discomfort. Reducing this radiant heat source through thermal equalization will help alleviate this condition.

All Air Pear fans are designed to run continuously, year-round, to maintain thermal equalization and general air movement. The fan speed can be maintained the same throughout the year or increased for the summer months to enhance the evaporative cooling effect if people in the space find this to be desirable.

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MAINTENANCE

Preventive Maintenance

Follow these easy steps to prevent any excess dirt buildup and preserve the life of the product:

No lubrication is required as bearings are sealed.

Cleaning:

- **Unplug unit from power source** first to prevent possible electrical shock and prevent injuries from spinning blades.
- Caution: Stationary blades can cause injury!
- You may clean the plastic housing with a damp cloth, using mild household detergent only.
- DO NOT use petroleum products, thinners, solvents, ammonia, alcohols or other chemicals to clean any part of the Air Pear unit.

Note: If fan is not operating or any parts are broken, contact manufacturer for replacement information.

TROUBLESHOOTING

General Troubleshooting

The Air Pear/Designer Series units are tested before they leave the factory, resulting in an extremely low rate of returns. However, mechanical devices do fail, and we recommend that you identify the problem and try the simple suggestions below.

Fan will not start:

a) Check fuses and circuit breakers.
b) Check voltage at fan connection.
c) Adjust the trim set screw in fan wall speed control (if using optional speed control). If minimum setting is too low the fan may shut off with voltage fluctuations. Increase minimum. See page 14 for more information.
d) Contact manufacturer for additional help: 1-888-AIR-PEAR (888-247-7327).

Fan airflow is too fast/slow:

a) Adjust speed control dial to produce desired flow. Adjust the trim set screw in fan wall speed control (if using optional speed control). If minimum setting is too low the fan may shut off with voltage fluctuations. Increase minimum. See page 14 for more information.

Fan has excess vibration (noise or wobbles):

a) Make certain the hanging hardware is secured tightly.
b) Contact manufacturer for additional help: 1-888-AIR-PEAR (888-247-7327).

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WARRANTY

Airius Warranty Policy

This warranty is limited to products purchased directly from Airius, LLC ("Airius") or one of its authorized resellers. To determine whether a reseller is authorized, please contact Airius at the contact information below.

Airius warrants products listed below will operate properly and be free of defects in materials and workmanship according to the following terms:

Products	Warranty Period
Air Pear Fans	3 Years (All Parts/Components)
Designer Series Fans	3 Years (All Parts/Components)
Retail Series Fans	3 Years (All Parts/Components)
Speed Controllers	1 Year (All Parts/Components)
Photohydroionization Cell	2 Years (All Parts/Components)

These include new units or units rebuilt under Airius' factory refurbish program. Airius will repair or replace such units, at Airius' sole discretion, if there is any defect in their materials or workmanship caused by Airius during the warranty period. With respect to replacement or repair rendered, Airius warrants that the parts replaced or repaired will operate properly and be free from defects in materials and workmanship for the remainder of the original warranty period.

Definitions:

1. The "warranty period" shall begin on the shipping date from the Airius factory to the customer (end user)
2. "Operate properly" applies to mechanical, electrical and structural functions only. No guarantee is made regarding the quantity of air movement or the appropriateness or the effectiveness or merchantability of any product for its intended purpose or for the customer's particular application.

Exclusions

Any of the following actions will constitute a breach of and will void all warranties:

1. Improper delivery, installation, or maintenance, including, but not limited to:
   a. Failure to follow the required installation procedures specified in the Airius "Installation Guide" and in all other documentation supplied with the fans and related equipment, including documentation provided by the manufacturers of the individual fan and control components;
   b. Failure to follow all applicable codes and ordinances, including, but not limited to the National Electric Code and state and local building codes;
   c. Failure to follow electrical engineering industry standards regarding the approved method of installing electrical equipment having the characteristics of the fans, the fan controls, and their related components, even if such standards are not explicitly referenced in any literature supplied by Airius or provided by the manufacturers of the fan and control components.
2. Any modification or alteration of, or adjustment to the fans, fan controls, and/or any disassembly of the components of the fans and fan controls for any purpose whatsoever, including any attempt to diagnose and/or repair any problem, without prior written authorization from Airius. Such disassembly includes, but is not limited to, separation of the motor from the housing assembly and/or removal of any electrical component from the fan controller unit.
3. Installation of fans into a detrimental environment with airborne oils / cutting fluids / solvents that may attack the base resin or motor, unless:
   a. Airius has provided written authorization prior to installation.
4. Misuse, abuse, accidents, unreasonable use or Acts of God.
5. Incorrect electric current, voltage or supply.
6. Failure to use fan controls supplied by Airius, unless:
   a. Airius has provided written authorization prior to installation; and
   b. The fan controls are built, operated and maintained according to specifications provided to and approved by Airius.

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Airius Warranty Policy (Continued)

7. Failure to perform periodic maintenance as detailed in the Airius-supplied "Installation Guide."
8. Consequential or incidental damages sustained by any person or entity as a result of any breach of these warranties are also excluded, except where such damages may not be excluded by law.

Acquiring Warranty Service

Do not return any item without first being assigned a Return Material Authorization (RMA) tag number. Customer must obtain a RMA# from Airius (888-AIR-PEAR or info@theairpear.com) before returning the faulty unit. RMA number must appear on the return-shipping label and be associated with any correspondence. Customer is responsible for all return shipping costs to:

Airius Warranty - RMA# ____
811 South Sherman Street
Longmont, Colorado 80501

Airius will return the unit(s) freight prepaid. Airius may elect to repair the same unit at customer site or offer replacement parts to facilitate repair and reduce customer down time and expense. Airius is not responsible for misuse of their product. Freight claims are the responsibility of the customer and all products are shipped FOB Longmont, Colorado, USA.

Remedy and Limit of Liability

The exclusive remedy of the purchaser, and the limit of liability for Airius, for any and all losses in connection with this product shall be repair or replacement of the warranted product or the affected components, as provided above.

Airius reserves the right to make the final determination, based on its own assessment, as to (1) whether the problem in question is the result of a defect in design, workmanship or materials, and not the result of error, misuse or abuse on the part of the customer, as set forth under the exclusions detailed above; (2) whether the problem or defect is material and requires action under this warranty; and (3) whether the remedy of repair or replacement is appropriate.

With regard to electrical and electronic components provided by Airius that comprise part of the products, including motors, Airius relies on the determination by the original manufacturer as to whether the failure of such component was the result of a defect. If the manufacturer of such component determines that there was no defect and therefore refuses to cover it under warranty, Airius likewise will not warranty such item.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY, REPRESENTATION OR CONDITION OF MERCHANTABILITY OR THAT THE PRODUCTS ARE FIT FOR ANY PARTICULAR PURPOSE OR USE, AND SPECIFICALLY IN LIEU OF ALL SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES. REPAIR OR REPLACEMENT SHALL BE THE SOLE REMEDY OF THE CUSTOMER AND THERE SHALL BE NO LIABILITY ON THE PART OF AIRIUS FOR ANY SPECIAL, INDIRECT, INCIDENTIAL, OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED, TO ANY LOSS OF BUSINESS OR PROFITS, WHETHER OR NOT FORESEEABLE.

Any and all disputes related to this warranty or any other matter related to Airius must be submitted to binding arbitration within 45 radial miles of Longmont, Colorado. The arbitrator will follow the Colorado Uniform Arbitration Act and the Rules of the American Arbitration Association. Under Colorado law, punitive damages are not recoverable by any party subject to arbitration. Moreover, jury trials are not available in arbitration. The arbitration decision or award is legally binding and enforceable. To the extent that a court rules that this paragraph is not enforceable, the parties agree to resolve any and all disputes in the Boulder District Court in Boulder, Colorado.

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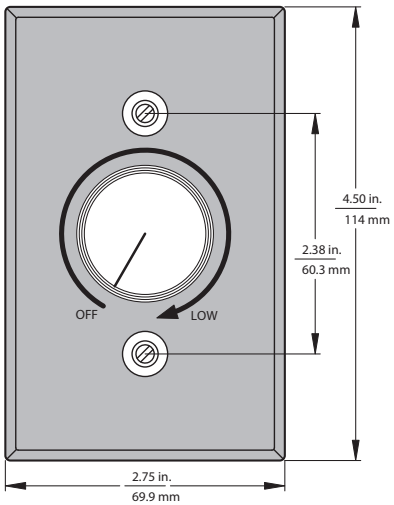
TRIAC-120-5 SPEED CONTROL SUBMITTAL

CONTROL OF SINGLE OR MULTIPLE SHADED POLE/PSC MOTOR

MODEL	VOLTAGE	AMPS
TRIAC-120-5	120V	5



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
QUANTITY	

PART NUMBER & QUANTITY

☐ TRIAC-120-5 Qty. _____

Note: Expect the fan to hum at the lower to middle speed where the sine-wave chopping is most severe. Fan control works best when fully loaded

TRIAC SPEED CONTROL DESCRIPTION

Airius speed controls are used to vary the speed of shaded pole (SP) or permanent split capacitor (PSC) motors. Speed controls for EC motors: refer to the potentiometer submittal. Speed control for EL fans: refer to the FanCenter submittal.

ATTRIBUTES AND CHARACTERISTICS

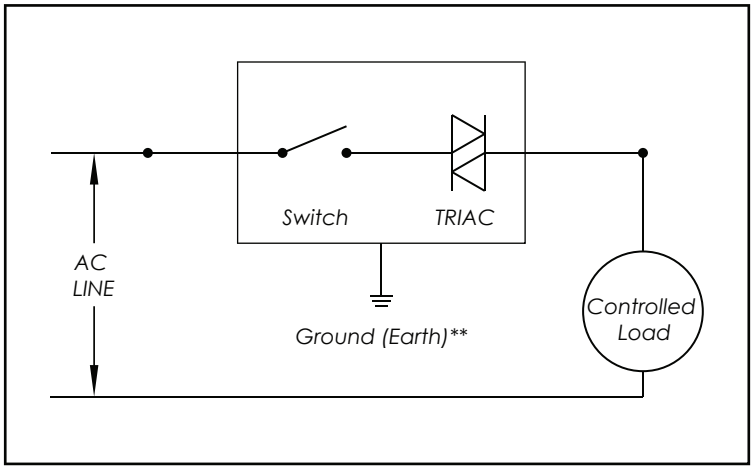
- *Built-in On/Off AC line switch*
- *Minimum speed trimpot*
- *RFI filter (provides RFI and EMI suppression)*
- *All models mount in a standard 2" x 4" electrical wall box*
- *Faceplate (4.5" x 2.75"), knob, screws and wire nuts included*
- *Simple installation by a qualified electrician*
- *Adjust top 50% RPM*
- *Can control multiple fans on a single dedicated circuit*

CODE APPROVAL

- *UL listing/recognition*
- *CSA certified*

WARRANTY

- *Warranty - 1 - years parts and workmanship*



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811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@airiusfans.com, www.airiusfans.com

May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

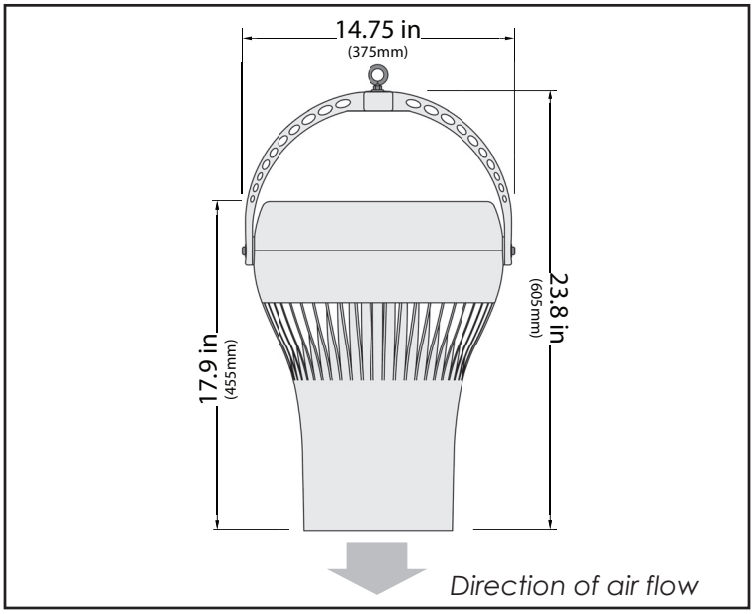
AIR PEAR 45-P4 DESTRATIFICATION FAN SUBMITTAL

SPECIFICATION SECTION: 23 34 00 - HVAC FANS

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	**dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
A-45-P4	120	50/60	0.40/0.41	44/46	1400/1650	595/715	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P4	230	50/60	0.19/0.2	42/45	1450/1630	595/707	54	14 lb	Up to 38 ft.	Up to 1200 ft²
A-45-P4	277	50/60	0.19/0.2	42/45	1450/1630	595/707	54	14 lb	Up to 38 ft.	Up to 1200 ft²

*0-static motor data supplied by fan manufacturer. Subject to change at any time.

**Sound pressure level at 3 feet. Sound Power Level 66 dB(A), designed to meet ISO 3744 – engineering grade precision for determining sound power.



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	45	P4 (permanent split capacitor)	(Standard) STD	**120** **230** **277**	**(Off White) W** **(Gray) G** **(Black) B**

EXAMPLE: A - 45 - P4 - STD - **120 - W**

- **Color**
- **Voltage (AC)**
- Nozzle Length
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season.

CERTIFICATION: *Conforms to UL-507, CAN/CSA C22.2#60335-1, UL 94 5VA and is ETL listed in USA and Canada.*

HOUSING: *PC/ABS resin, 5VA flame resistance rating*

MOTOR: *Permanent Split Capacitor, single speed (variable with optional speed control), axial motor. Motor is thermally protected. Operating temperature: -13˚ F (-25˚ C) to 158˚ F (70˚ C). No lubrication required. Bearings are sealed. 6' cord and plug provided for 120V, no plug for 230/277V*

GUARD GRILLE: *Steel, phosphated and coated in black plastic*

STATOR: *Patented multi-vane stator significantly increases air throw for maximizing performance. PC/ABS.*

SAFETY CABLE: *6' length steel cable (fastened to body)*

WARRANTY*: Warranty - 3-years parts and workmanship. Money back guarantee - 30 days. Refurbish program after 3-year warranty period.*

FACTORY INSTALLED OPTIONS:

Item #	Description	Qty
PHI-9-C	Factory installed 9 in. PHI cell	

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

Item #	Description	Qty
TRIAC-120-1.5	120VAC, 1.5A wall mounted speed control	
TRIAC-120-5	120VAC, 5A wall mounted speed control	
TRIAC-120-15	120VAC, 15A wall mounted speed control	
TRIAC-230-8	230VAC, 8A wall mounted speed control	
TRIAC-277-5	277VAC, 5A wall mounted speed control	
TRIAC-SMART-7.5	95-250VAC, 7.5A, electrical box speed control	

COLOR OPTIONS:

"Off White" Cool Gray 2C — "Gray" Gray 432C — Black

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May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

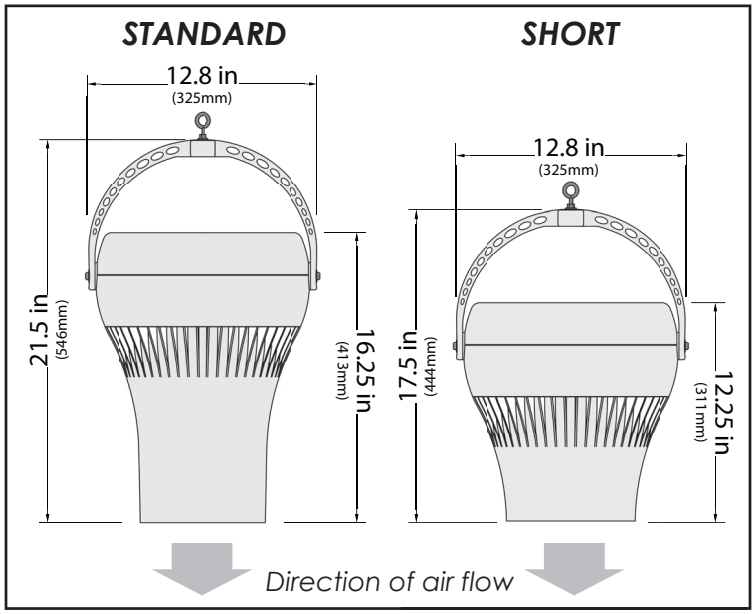
AIR PEAR 25-SP DESTRATIFICATION FAN SUBMITTAL

SPECIFICATION SECTION: 23 34 00 - HVAC FANS

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	**dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
A-25-SP	120	50/60	0.30/0.32	30/35	1500/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-SP	230	50/60	0.14/0.13	31/33	1450/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
A-25-SP	277	50/60	0.13/0.17	35/45	1500/1650	459/547	45	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²

**0-static motor data supplied by fan manufacturer. Subject to change at any time.*

***Sound pressure level at 3 feet. Sound Power Level 58 dB(A), designed to meet ISO 3744 – engineering grade precision for determining sound power.*



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	25	SP (Shaded Pole)	(Short) SH (Standard) STD	120 230 277	(Off White) W (Gray) G (Black) B

EXAMPLE: A - 25 - SP - **STD - 120 - W**

- **Color**
- **Voltage (AC)**
- **Nozzle Length**
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season.

CERTIFICATION: *Conforms to UL-507, CAN/CSA C22.2#60335-1, UL 94 5VA and is ETL listed in USA and Canada.*

HOUSING: *PC/ABS resin, 5VA flame resistance rating*

MOTOR: *Single phase, shaded pole, single speed (variable with optional speed control), axial motor. Motor is thermally protected. Operating temperature: -4˚ F (-20˚ C) to 158˚ F (70˚ C). No lubrication required. Bearings are sealed. 6' cord and plug provided for 120V, no plug for 230V.*

STATOR: *Patented multi-vane stator significantly increases air throw for maximizing performance. PC/ABS.*

SAFETY CABLE: *6' length steel cable (fastened to body)*

WARRANTY*: Warranty - 3-years parts and workmanship. Money back guarantee - 30 days. Refurbish program after 3-year warranty period.*

FACTORY INSTALLED OPTIONS:

Item #	Description	Qty
PHI-9-C	Factory installed 9 in. PHI cell	
PHI-5-C	Factory installed 5 in. PHI cell	
GUARD25	Silver intake grille	

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

Item #	Description	Qty
TRIAC-120-1.5	120VAC, 1.5A wall mounted speed control	
TRIAC-120-5	120VAC, 5A wall mounted speed control	
TRIAC-120-15	120VAC, 15A wall mounted speed control	
TRIAC-230-8	230VAC, 8A wall mounted speed control	
TRIAC-277-5	277VAC, 5A wall mounted speed control	
TRIAC-SMART-7.5	95-250VAC, 7.5A, electrical box speed control	

COLOR OPTIONS:

"Off White" Cool Gray 2C *"Gray" Gray 432C* *Black*

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811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@airiusfans.com, www.airiusfans.com

May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

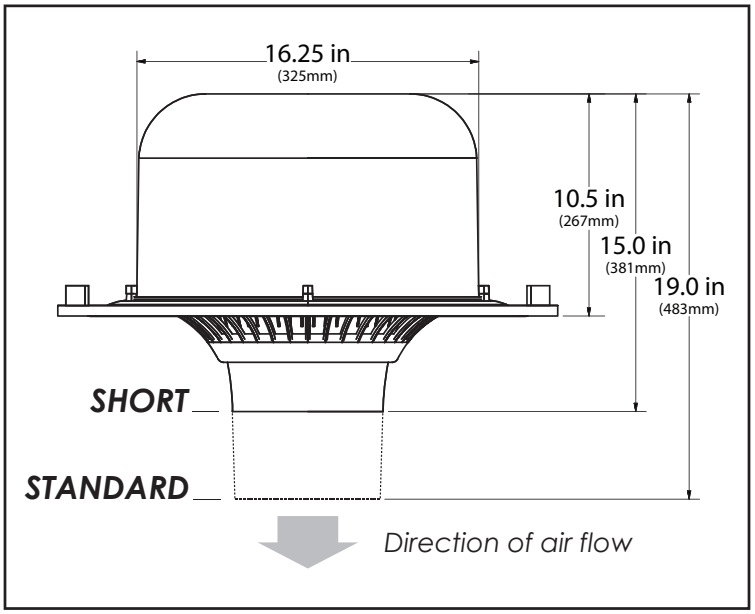
AIR PEAR SUSPENDED 25-SP DESTRATIFICATION FAN SUBMITTAL

SPECIFICATION SECTION: 23 34 00 - HVAC FANS

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	**dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
S-25-SP	120	50/60	0.30/0.32	30/35	1500/1650	459/547	45	16 lb	Up to 25 ft.	Up to 1200 ft²
S-25-SP	230	50/60	0.14/0.13	31/33	1450/1650	459/547	45	16 lb	Up to 25 ft.	Up to 1200 ft²
S-25-SP	277	50/60	0.13/0.17	35/45	1500/1650	459/547	45	16 lb	Up to 25 ft.	Up to 1200 ft²

*0-static motor data supplied by fan manufacturer. Subject to change at any time.

**Sound pressure level at 3 feet. Sound Power Level 58 dB(A), designed to meet ISO 3744 – engineering grade precision for determining sound power.



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
S (Suspended)	25	SP (Shaded Pole)	(Short) SH (Standard) STD	120 230 277	(Off White) W (Black) B

EXAMPLE: S - 25 - SP - **STD - 120 - W**

- **Color**
- **Voltage (AC)**
- **Nozzle Length**
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season.

CERTIFICATION: *Conforms to UL-507, CAN/CSA C22.2#60335-1, UL 94 5VA and is ETL listed in USA and Canada.*

HOUSING: *PC/ABS resin, 5VA flame resistance rating*

MOTOR: *Single phase, shaded pole, single speed (variable with optional speed control), axial motor. Motor is thermally protected. Operating temperature: -4˚ F (-20˚ C) to 158˚ F (70˚ C). No lubrication required. Bearings are sealed. A junction box and receptacle are supplied. Electrical contractor will need to provide MC cable and wire directly to j-box/receptacle mounted to side of dome.*

STATOR: *Patented multi-vane stator significantly increases air throw for maximizing performance. PC/ABS.*

WARRANTY*: Warranty - 3-years parts and workmanship. Money back guarantee - 30 days. Refurbish program after 3-year warranty period.*

FACTORY INSTALLED OPTIONS:

Item #	Description	Qty
PHI-9-C	Factory installed 9 in. PHI cell	
PHI-5-C	Factory installed 5 in. PHI cell	
GUARD25	Silver intake grille	

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

Item #	Description	Qty
TRIAC-120-1.5	120VAC, 1.5A wall mounted speed control	
TRIAC-120-5	120VAC, 5A wall mounted speed control	
TRIAC-120-15	120VAC, 15A wall mounted speed control	
TRIAC-230-8	230VAC, 8A wall mounted speed control	
TRIAC-277-5	277VAC, 5A wall mounted speed control	
TRIAC-SMART-7.5	95-250VAC, 7.5A, electrical box speed control	

COLOR OPTIONS:

"Off White" Cool Gray 2C

Black

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May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

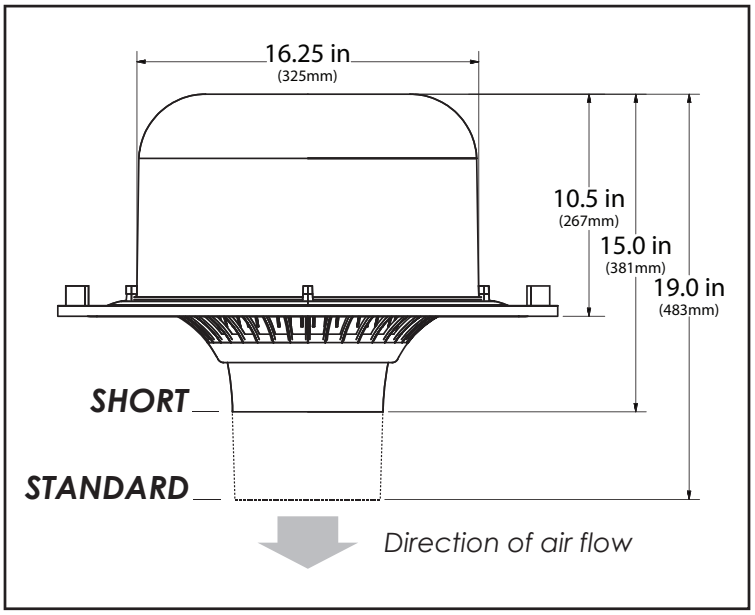
AIR PEAR SUSPENDED 15-SP DESTRATIFICATION FAN SUBMITTAL

SPECIFICATION SECTION: 23 34 00 - HVAC FANS

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	**dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
S-15-SP	120	50/60	0.11/0.14	13.5/17	1230/1260	406	29	16 lb	Up to 18 ft.	Up to 800 ft²
S-15-SP	230	50/60	0.06/0.07	15/17	1230/1260	406	29	16 lb	Up to 18 ft.	Up to 800 ft²

**0-static motor data supplied by fan manufacturer. Subject to change at any time.*

***Sound pressure level at 3 feet. Sound Power Level 44 dB(A), designed to meet ISO 3744 – engineering grade precision for determining sound power.*



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
S (Suspended)	15	SP (Shaded Pole)	**(Short) SH (Standard) STD**	**120 230**	**(Off White) W (Black) B**

EXAMPLE: S - 15 - SP - **STD - 120 - W**

- **Color**
- **Voltage (AC)**
- **Nozzle Length**
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season.

CERTIFICATION: *Conforms to UL-507, CAN/CSA C22.2#60335-1, UL 94 5VA and is ETL listed in USA and Canada.*

HOUSING: *PC/ABS resin, 5VA flame resistance rating*

MOTOR: *Single phase, shaded pole, single speed (variable with optional speed control), axial motor. Motor is thermally protected. Operating temperature: -4˚ F (-20˚ C) to 158˚ F (70˚ C). No lubrication required. Bearings are sealed. A junction box and receptacle are supplied. Electrical contractor will need to provide MC cable and wire directly to j-box/receptacle mounted to side of dome.*

STATOR: *Patented multi-vane stator significantly increases air throw for maximizing performance. PC/ABS.*

WARRANTY*: Warranty - 3-years parts and workmanship. Money back guarantee - 30 days. Refurbish program after 3-year warranty period.*

FACTORY INSTALLED OPTIONS:

Item #	Description	Qty
PHI-9-C	Factory installed 9 in. PHI cell	
PHI-5-C	Factory installed 5 in. PHI cell	
GUARD25	Silver intake grille	

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

Item #	Description	Qty
TRIAC-120-1.5	120VAC, 1.5A wall mounted speed control	
TRIAC-120-5	120VAC, 5A wall mounted speed control	
TRIAC-120-15	120VAC, 15A wall mounted speed control	
TRIAC-230-8	230VAC, 8A wall mounted speed control	
TRIAC-SMART-7.5	95-250VAC, 7.5A, electrical box speed control	

COLOR OPTIONS:

"Off White" Cool Gray 2C

Black

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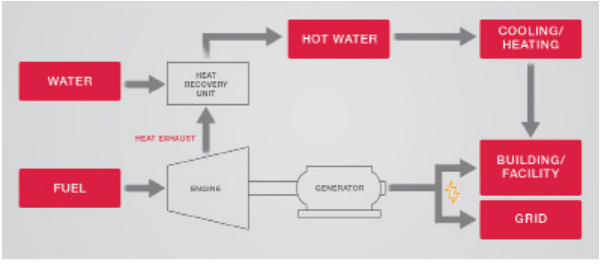
May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

YANMAR

CP5WN

Using natural gas or propane, the CP5WN's high-efficiency generator provides 5kW of electrical power. The engine heat is captured and heats water at a rated temperature of 149°F for immediate use or storage in your facility. Excess electricity production may be sold back onto the grid in certain states, creating a credit on your electric bill.

CHP Basic Flow



Model			CP5WN	
			CP5WN-SNB (*5)	CP5WN-SPB
Power	Output	Rated Output	5 kW	
		Voltage	240/120 V, 60Hz (208V, 277V)	
		Phases/Wires	Single phase, 3 wire	
		Modulation	0.3 to 5 kW with optional CT/Transducer kit (*1)	
Fuel	Gas type		Natural gas	Propane gas
	Pressure	Standard	8 in WC (2kPa)	11 in W/C (2.8kPa)
		Range	4 ~ 10 in WC (1 ~ 2.5kPa)	8 ~ 13 in W/C (2 ~ 3.3kPa)
	Consumption (LHV)		60,700 BTU (17.8 kW)	
			0.61 therms/hr	0.72 Gallon (*3)
	Consumption (HHV) (*3, *4)		67,300 BTU (19.7 kW)	66,000 BTU (19.3 kW)
			0.67 therms/hr	0.72 Gallon (*3)
Heat output	Rated recovered heat		34,100 BTU/h (10kW)	
	Rated hot water temp.	Inlet	140 F (60 C)	
		Outlet	149 F (65 C)	
	Rated Hot water flow rate		7.3 GPM (27.6 L/min)	
	Maximum hot water temp. (Outlet)		163 F (73 C)	
Input power	Voltage, Frequency		240V, 60Hz	
	Starting current		12.5 A	
	Power consumption	Radiator fan stop	0.23 kW	
		Radiator fan run	0.33 kW	
Gross Efficiency (LHV)	Overall efficiency		84%	
	Electrical generation efficiency		28%	
	Exhaust heat recovery ratio		56%	
Sound level	Radiator fan stopped		51 dB (A)	
	Radiator fan operating		54 dB (A)	
Dimensions	Width		43.3 in (1,000 mm)	
	Depth		19.7 in (500 mm)	
	Height		59.1 in (1,500 mm)	
	Net weight		882 lb (400 kg)	
Maintenance Interval			10,000 hrs	
Standard Warranty			2 Years; Unlimited Hours	
YES Product Protection	10 Years / 30,000 hrs		Optional	
	10 Years / 60,000 hrs		Optional	
	15 Years / 90,000 hrs		Optional	
Emissions & Certifications			EPA Certified UL2200 Certified CSAC22.2 No 14 Certified CSAC22.2 No 100 Certified UL1741/IEEE1547 Certified (*2)	

*1: The minimum modulation amount is dependent on the CT and Transducer specifications.
*2: External inverter models
*3: Propane gas calculations for fuel consumption are based on converting LHV to HHV: LHV=84,250 BTU/Gallon, HHV=91,420 BTU/Gallon
*4: Natural gas calculations for fuel consumption are based on converting LHV to HHV: LHV= 983 BTU/scf, HHV = 1,089 BTU/scf
*5: CP5WN-SNB model discontinued

CHP & EPA COMBINED HEAT AND POWER PARTNERSHIP

ETL LISTED c US Intertek

NOTE: Due to YANMAR's ongoing commitment to quality, specifications, ratings and dimensions subject to change without notice. Improper installation, adjustment, alteration, service or maintenance can cause property damage or personal injury. Installation and service must be in accordance with current specifications, ratings and dimensions and be performed by a qualified installer and servicing agency.

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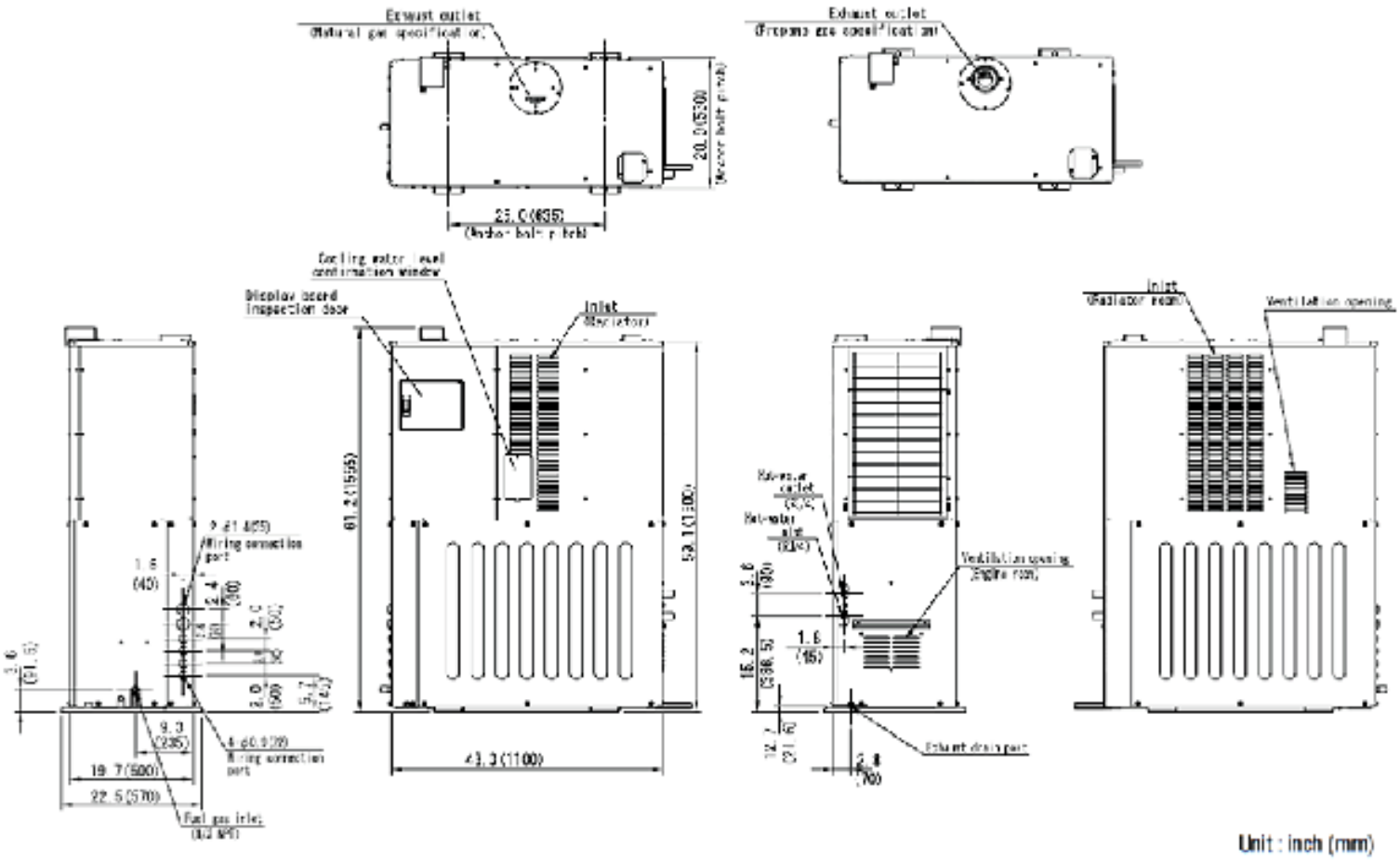
CP5WN



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E15YMESPC01

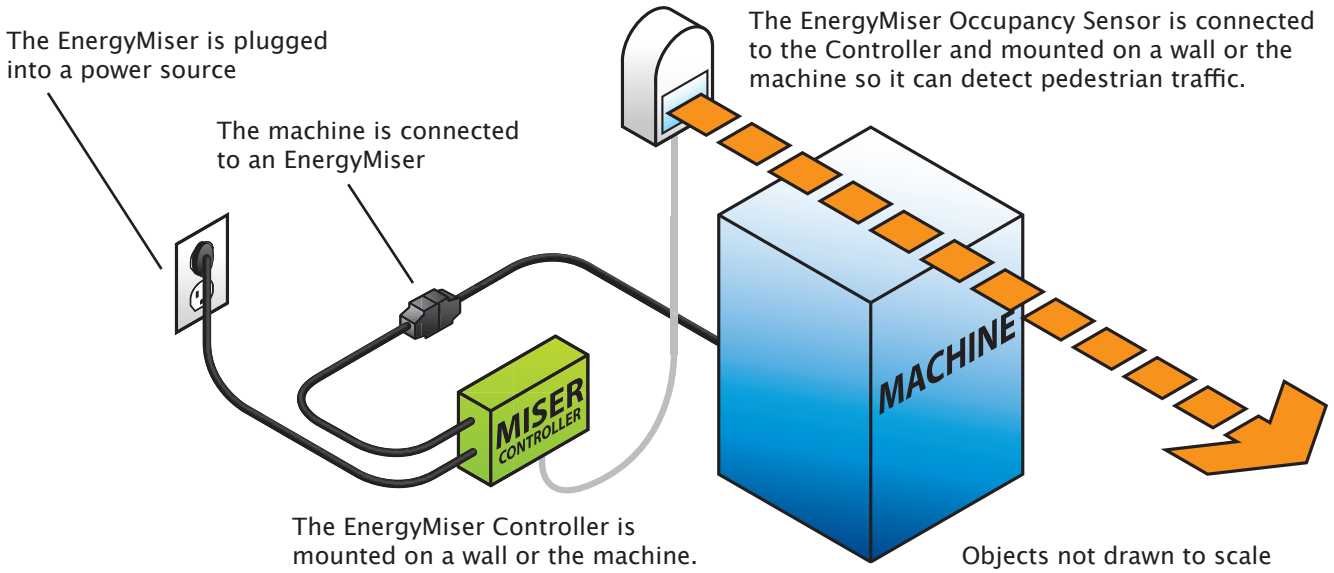
EnergyMisers

EnergyMiser® Products are easy to install devices designed to lower the energy consumption of vending machines, commercial coolers, and other "always on" machines and appliances. No other technology can compete with its price and ease of installation for the immediate energy savings that can be achieved.

- Win and retain accounts by offering energy-efficient technology
- Save clients up to $150 per machine, per year
- Typical return on investment in 12 months
- Easy retrofit field installation
- Reduction in machine energy use an average of 35-45%
- Reduced machine maintenance and longer machine lifespans
- Environmental benefits such as reducing pollution and natural resource use

How EnergyMisers Work

External EnergyMisers use a controller and a machine mounted sensor to monitor room occupancy and temperature. If 15 minutes pass without any pedestrian traffic, the EnergyMiser will power down the machine. The machine is powered back up when people return and at regular intervals to to keep the product cold. External controllers are best suited for low traffic areas.



Internal EnergyMisers use sales based intelligence to power down the cooling system while leaving lighting and controller electronics on. While the cooling system is powered down, the internal EnergyMiser monitors the room's temperature and automatically re-powers the cooling system at regular intervals to keep the product cold. Internal controllers are best suited for high traffic areas.

Who Uses EnergyMisers

Several large retailers such as Wal-Mart and Kroger have installed EnergyMiser Products at their locations. Educational facilities along with the US Government have purchased EnergyMisers through GSA. Also, many utilities offer rebates on the purchase of EnergyMiser products and several have provided customers with EnergyMiser Products at no cost through Turnkey Programs.

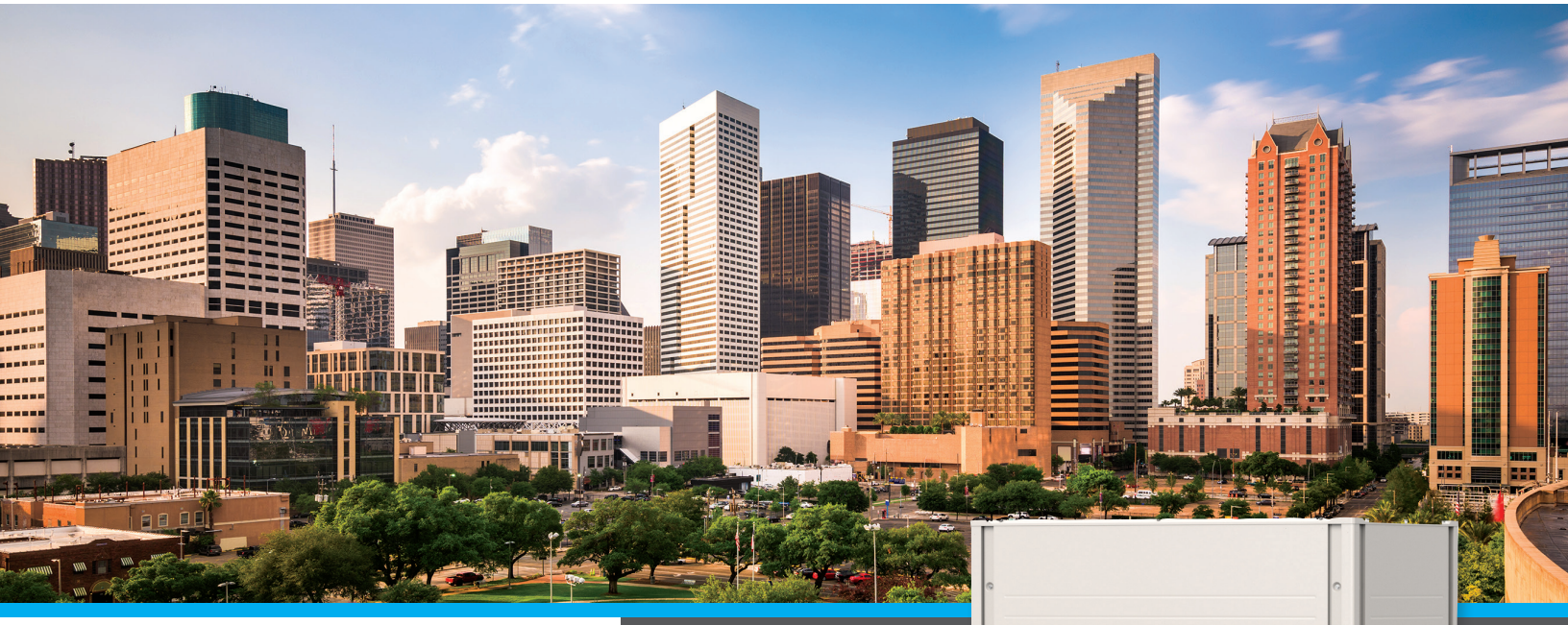
USA Technologies 100 Deerfield Lane, Suite 140, Malvern, PA 19355 • 800.633.0340 • www.usatech.com

DAIKIN
AIR INTELLIGENCE™

NEW!

VRV IV

Air-Cooled Heat Pump
RXYQ_TATJU / RXYQ_TAYDU



Commercial.
Renovation.
New construction.

Daikin's VRV IV systems integrate advanced technology to provide comfort control with high energy efficiency and reliability. VRV IV provides heating and cooling solutions for multi-family residential to large commercial applications. Daikin VRV IV is the first variable refrigerant flow (VRF) system assembled in North America.

Main features and benefits:

- Total comfort solution for heating, cooling, ventilation and controls.
- Redesigned and optimized for low total Life Cycle Cost (LCC).
- Available in large capacity single modules up to 14 tons and systems up to 34 tons allowing for a more flexible system design.
- Year-round comfort and energy efficiency delivered by combining VRV and VRT technologies.
- High energy efficiency with IEER values up to 27.3.
- Integrated inverter technology delivers high efficiency during part load conditions and provides precise individual zone control.
- Design flexibility with long piping lengths up to 3,280 ft. total, and up to 100 ft. vertical separation between indoor units.
- Corrosion resistant 1000 hr. salt-spray tested Daikin PE blue fin heat exchanger.
- Reduced commissioning time with VRV configuration software and Graphical User Interface (GUI), as compared to VRV III.
- VRV IV takes advantage of Daikin's unique zone and centralized controls that are optimized for the specific needs of North America.
- Outstanding 10-year limited parts warranty* as standard.

Additional information
Before purchasing this appliance, read important information about its estimated annual energy consumption, yearly operating cost, or energy efficiency rating that is available from your retailer.

FIND OUT MORE ABOUT DAIKIN VRV.

*Complete warranty details available from your local distributor, manufacturer's representative, www.daikincomfort.com or www.daikinac.com.

VRV IV Operations

Variable Refrigerant Temperature

Lower capacity is required to cool and heat a building during mid-season.

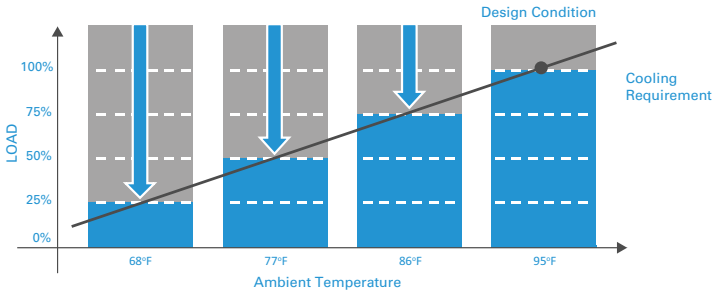
A VRV system adapts to the required changes in capacity by varying the refrigerant volume. This results in an increase in efficiency at part load operation.

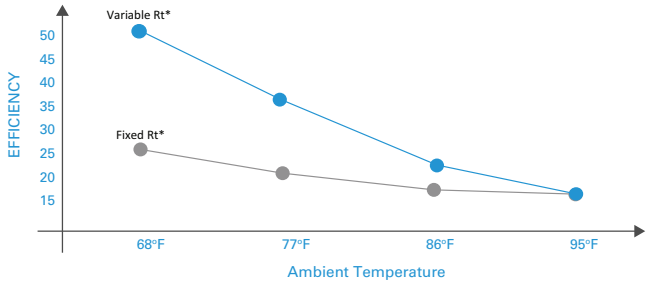
The efficiency of the VRV IV system is further increased by adjusting the refrigerant temperature depending on space load and weather conditions.

Up to 28% Improved Seasonal Cooling Efficiency vs. VRV III

VRV IV VRT Advantages

The graphs below are intended only to depict how new Daikin VRV IV efficiency is increased by using VRT.





*Data based on RXYQ96 outdoor unit only with 100% connection ratio.

Technical Data for VRV IV Heat Pump Outdoor Units

			6 Ton	8 Ton	10 Ton	12 Ton	14 Ton
Model	208-230V/3Ph/60Hz		RXYQ72TATJU	RXYQ96TATJU	RXYQ120TATJU	RXYQ144TATJU	RXYQ168TATJU
	460V/3Ph/60Hz		RXYQ72TAYDU	RXYQ96TAYDU	RXYQ120TAYDU	RXYQ144TAYDU	RXYQ168TAYDU
Performance	Rated Cooling Capacity	Btu/h	69,000	92,000	114,000	138,000	160,000
	Rated Heating Capacity	Btu/h	73,000	103,000	129,000	154,000	176,000
	Operation Range - Cooling	°F DB	10*-122	10*-122	10*-122	10*-122	10*-122
	Operation Range - Heating	°F WB	-4 - 60	-4 - 60	-4 - 60	-4 - 60	-4 - 60
	Sound Pressure	dB(A)	58	61	61	64	65
	IEER (Ducted / Non-Ducted)		20.7 / 25.9	22.5 / 27.3	22 / 25.4	22.6 / 24.8	19.8 / 22.6
	Airflow	cfm	5,544	5,827	6,286	8,228	8,228
Refrigerant Piping	Vertical Pipe Length Above	ft.	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)
	Vertical Pipe Length Below	ft.	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)
	Vertical Pipe Length Between IDU	ft.	100	100	100	100	100
	Actual Pipe Length	ft.	540	540	540	540	540
	Equivalent Pipe Length	ft.	620	620	620	620	620
	Total Pipe Length	ft.	3,280	3,280	3,280	3,280	3,280
Unit	Weight (RXYQ_TAT / RXYQ_TAY)	lbs.	435 / 451	525 / 553	528 / 556	695 / 709	
	Dimensions (H x W x D)	in.	66-11/16 x 36-11/16 x 30-3/16	66-11/16 x 48-7/8 x 30-3/16			

			16 Ton	18 Ton	20 Ton	22 Ton	24 Ton
Model	208-230V/3Ph/60Hz		RXYQ192TATJU	RXYQ216TATJU	RXYQ240TATJU	RXYQ264TATJU	RXYQ288TATJU
	460V/3Ph/60Hz		RXYQ192TAYDU	RXYQ216TAYDU	RXYQ240TAYDU	RXYQ264TAYDU	RXYQ288TAYDU
	Combination		1 x RXYQ120T 1 x RXYQ72T	1 x RXYQ120T 1 x RXYQ96T	2 x RXYQ120T	1 x RXYQ144T 1 x RXYQ120T	2 x RXYQ144T
Performance	Rated Cooling Capacity	Btu/h	184,000	206,000	228,000	250,000	274,000
	Rated Heating Capacity	Btu/h	206,000	230,000	256,000	282,000	308,000
	Operation Range - Cooling	°F DB	23-122	23-122	23-122	23-122	23-122
	Operation Range - Heating	°F WB	-4 - 60	-4 - 60	-4 - 60	-4 - 60	-4 - 60
	Sound Pressure	dB(A)	63	64	64	66	67
	IEER (Ducted/Non-Ducted)		21.2 / 22.2	21.1 / 20.5	20.9 / 20.8	19.6 / 20.3	19.6 / 20.1
	Airflow	cfm	5,544 + 6,286	5,827 + 6,286	6,286 + 6,286	6,286 + 8,228	8,228 + 8,228
Refrigerant Piping	Vertical Pipe Length Above	ft.	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)
	Vertical Pipe Length Below	ft.	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)
	Vertical Pipe Length Between IDU	ft.	100	100	100	100	100
	Actual Pipe Length	ft.	540	540	540	540	540
	Equivalent Pipe Length	ft.	620	620	620	620	620
	Total Pipe Length	ft.	3,280	3,280	3,280	3,280	3,280
Unit	Weight (RXYQ_TAT / RXYQ_TAY)	lbs.	435 + 528 / 451 + 556	525 + 528 / 553 + 556	528 + 528 / 556 + 556	528 + 695 / 556 + 709	695 + 695 / 709 + 709
	Dimensions (H x W x D)	in.	(66-11/16 x 48-7/8 x 30-3/16) + (66-11/16 x 36-11/16 x 30-3/16)	(66-11/16 x 48-7/8 x 30-3/16) x 2			

			26 Ton	28 Ton	30 Ton	32 Ton	34 Ton
Model	208-230V/3Ph/60Hz		RXYQ312TATJU	RXYQ336TATJU	RXYQ360TATJU	RXYQ384TATJU	RXYQ408TATJU
	460V/3Ph/60Hz		RXYQ312TAYDU	RXYQ336TAYDU	RXYQ360TAYDU	RXYQ384TAYDU	RXYQ408TAYDU
	Combination		1 x RXYQ168T 1 x RXYQ144T	2 x RXYQ168T	3 x RXYQ120T	1 x RXYQ168T 1 x RXYQ120T 1 x RXYQ96T	1 x RXYQ168T 1 x RXYQ144T 1 x RXYQ96T
Performance	Rated Cooling Capacity	Btu/h	296,000	312,000	334,000	352,000	372,000
	Rated Heating Capacity	Btu/h	334,000	344,000	372,000	400,000	435,000
	Operation Range - Cooling	°F DB	23-122	23-122	23-122	23-122	23-122
	Operation Range - Heating	°F WB	-4 - 60	-4 - 60	-4 - 60	-4 - 60	-4 - 60
	Sound Pressure	dB(A)	68	68	66	68	68
	IEER (Ducted/Non-Ducted)		18.8 / 19.9	18.5 / 20.6	18.5 / 19.4	18.5 / 21.1	19.0 / 21.1
	Airflow	cfm	8,228 + 8,228	8,228 + 8,228	6,286 + 6,286 + 6,286	5,827 + 6,286 + 8,228	6,286 + 6,286 + 8,228
Refrigerant Piping	Vertical Pipe Length Above	ft.	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)	164 (295 w/outdoor setting)
	Vertical Pipe Length Below	ft.	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295 w/outdoor setting)	130 (295/w/outdoor setting)	130 (295 w/outdoor setting)
	Vertical Pipe Length Between IDU	ft.	100	100	100	100	100
	Actual Pipe Length	ft.	540	540	540	540	540
	Equivalent Pipe Length	ft.	620	620	620	620	620
	Total Pipe Length	ft.	3,280	3,280	3,280	3,280	3,280
Unit	Weight (RXYQ_TAT / RXYQ_TAY)	lbs.	695 + 695 / 709 +709	695 + 695 / 709 +709	528 + 528 + 528 / 525 +528 + 695	525 + 528 + 695 / 553 + 556 + 709	525 + 695 + 695 / 553 + 709 + 709
	Dimensions (H x W x D)	in.	(66-11/16 x 48-7/8 x 30-3/16) x 2		(66-11/16 x 48-7/8 x 30-3/16) x 3		

For all equipment installation and application limitations please refer to the specific Engineering Data Books. * Application rules apply.

Our continuing commitment to quality products may mean a change in specifications without notice.
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EnergyMiser Products

VendingMiser®- for cold drink vending machines
VM150 - Indoor Wall Mount Controller with Occupancy Sensor
VM151 - Indoor Wall Mount Controller with 10' Repeater Cable
VM160 - Outdoor Wall Mount Controller with Occupancy Sensor and Weather-proof Enclosure
VM161 - Outdoor Wall Mount Controller with 10' Repeater Cable and Weather-proof Enclosure
VM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
VM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
VM180 - Outdoor Controller with EZ Mount Z-Bracket, Occupancy Sensor, and Weatherproof Enclosure
VM181 - Outdoor Controller with EZ Mount L-Bracket, 10' Repeater Cable and Weatherproof Enclosure
VM2iQ - Internal VendingMiser

CoolerMiser™- for commercial glass-front coolers
CM150 - Indoor Wall Mount Controller with Occupancy Sensor
CM151 - Indoor Wall Mount Controller with 10' Repeater Cable
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PlugMiser™- for most major electrical equipment
PM150 - Indoor Wall Mount Controller with Occupancy Sensor
PM151 - Indoor Wall Mount Controller with 10' Repeater Cable
PM190 - Indoor Controller with Leg Mount and Occupancy Sensor

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APPENDIX 4 SAFETY MANAGEMENT PLAN

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HSE Safety Management Plan

Prepared by:	Michael Martoglio
Signature:	
Date:	11/28/18
HSE Manager:	Sharon Arents
Signature:	
Date:	
Customer:	Montville Board of Education
Signature:	
Date:	

NOTE: A SIGNED AND ACCEPTED COPY IS TO BE KEPT ON SITE AND ON CONTRACT FILE.

INTRODUCTION

The Health, Safety & Environmental (HSE) Site Management Plan is an integral part of all work and site specific procedures for all Honeywell operations. Honeywell is committed to developing safety systems which ensure the highest standard of health and safety for all employees. We aim to continually improve the systems of work and strive for best practice in the area of health, safety and environment. Honeywell aims to control risk through the implementation of an effective HSE Site Management Plan and Program.

The objective of this document is to establish a plan for implementing the company safe operations management program. The plan is intended to minimize losses, meet regulatory compliance requirements and to implement site health, safety and environmental regulations established by the Customer.

Honeywell demonstrates its commitment to health and safety by making all levels of management accountable for all health and safety issues. We attribute the success of effective safety systems to the ability to communicate the agreed standards of performance between employees and management. Honeywell's commitment to health, safety and the environment can be viewed at **Attachment 1: Honeywell HSE Commitment Statements**.

1. Plan Deployment

The HSE Plan is one component of Honeywell's Safe Operations Management (SOM) program. The HSE Plan, and its relevant components and references specific to this project, should be reviewed with the Customer, Honeywell representatives and subcontractors/contractors to ensure effective deployment of the SOM program. This includes:

(1) On-site meeting between Customer and Honeywell representative(s) and subcontractors.
(2) Customer and Honeywell representative(s) and subcontractors are briefed and understand the Safety Management Plan:
    a) Site information,
    b) Hazard and risk assessments,
    c) HSE training,
    d) Activity schedules,
    e) Measures of HSE performance.
(3) Plan is to be reviewed on a quarterly basis to ensure Management of Change.
(4) Plan shall be maintained to ensure that relevant information is available to employees, contractors, customers, clients and the public concerning the effects of the Company's activities and materials on the safety and health of people and impact on the environment.
(5) Communication and management systems shall be developed, implemented and maintained throughout each site to facilitate continuous improvement in performance.

Honeywell Internal

(6) Active consultation and communication with employees and contractors in the improvement of health, safety and environmental work.

Honeywell Management Systems are the property of Honeywell and must be maintained in accordance with Honeywell Information Security guidelines. Clients wishing to view any components of the Honeywell Operating System (external to Safe Operations Management) can request to do so by contacting the Honeywell Project Manager, who will assess the request and where deemed appropriate, arrange for viewing of the relevant Honeywell information.

2. Revision Sheet

When changes are made to this document, the revision sheet must be revised and all controlled copies of the document updated and distributed per the Distribution List.

Revision	Date	Description
Initial Draft	11/28/18	Initial Document

3. Distribution List

One hard copy will be maintained for the assigned contract on site. Electronic copy can be distributed, upon request.

Copy	Name	Organization & Title	Email Address
1	Salvatore Corcione	Honeywell Project Manager	Salvatore.Corcione@Honeywell.com
2	Sharon Arents	Honeywell HSE Leader	Sharon.Arents@Honeywell.com
3	Bob Letso	Honeywell PM Leader	Robert.Letso@Honeywell.com
4	Steven Toth	Customer Project Manager	Steven.Toth@Montville.net
5	Steven Toth	Customer HSE Leader	Steven.Toth@Montville.net

4. Contents

Introduction
Section 1 Site Information
Section 2 Site Hazards and Safety Management Plan
Section 3 Site Requirements
Section 4 Site HSE Activity Schedule
Section 5 Site HSE Performance
Section 6 Contract Form and Attachments

SECTION 1 – SITE INFORMATION & HSE ADMINISTRATION

5. Contract – Scope of Work Description

Project name:	**Montville BOE ESIP**
Customer name and address:	**Montville Board of Education** **86 River Road, Montville, NJ 07045**
Scope of work (summary):	LED lighting upgrades, mechanical upgrades, building envelope improvements
Start Date:	TBD
Completion Date:	TBD

6. Key Project Contacts (List all Honeywell Employees & Contractors)

Honeywell Project Manager	Salvatore Corcione	Salvatore.Corcione@Honeywell.com
Honeywell Project Supervisor	Michael Martoglio	Michael.Martoglio@Honeywell.com
Honeywell Branch Project Manager	Victor Silveira	Victor.Silveira@Honeywell.com
Honeywell Regional HSE Leader	Sharon Arents	Sharon.Arents@Honeywell.com
Customer Project Manager	Steven Toth	Steven.Toth@Montville.net
Customer HSE Leader	Steven Toth	Steven.Toth@Montville.net
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		

7. Customer HSE Reporting

Honeywell will report HSE performance to the Customer, if required, as defined in the scope of work and/or contract. Reporting topics may include:

- Customer requested HSE metrics at customer request,
- Incidents/injuries, Safety Observation System events,
- Summary of HSE Project Manager site reviews/audits, Contractor audit results

8. Cardinal Rules – Unacceptable Behaviors & Attitudes

The Cardinal Rules shall be displayed at all Honeywell locations, including field offices and also at designated Honeywell offices within the Customer site. All employees are to adhere to the Cardinal Rules which can be viewed at **Attachment 2: Honeywell Cardinal Rules**.

9. Responsibilities, Authority & Resources

Management & Resources

The Honeywell Project Manager is responsible for the implementation of the Honeywell Health, Safety and Environment Plan requirements and shall maintain and monitor programs aimed at continuous improvement of HSE performance. Appropriate health, safety and environmental support and resources shall be available to assist project and service managers to discharge their responsibilities.

Honeywell Project Manager Responsibilities

Each PM is accountable for implementation of Honeywell's HSE Policy. Specific responsibilities are:

- Supports and promotes jobsite safety through leadership and example.
- Becomes involved in task safety analysis in order to identify any hazards and manage the associated risks prior to work being done.
- Ensures the completion of job hazard analysis prior to the beginning of any work including review and approval.
- Insist upon employee's and subcontractor's compliance with established safety rules, correcting any unsafe acts or conditions, and implementing corrective or disciplinary actions as necessary for the effective functioning of the safety program.
- Ensure all team members are trained in safe work procedures.
- Ensure regular hazard inspections are carried out within areas under their control.
- Verify that employees and subcontractors implement the designated site safe work procedures/systems.
- Ensure approved Honeywell employee protective equipment is issued and proper instruction given as to its use, maintenance and storage.
- Be involved in formal as well as informal safety audits and monitor contractor and site safety performance on a regular basis.
- Ensure that all accidents and injuries are reported and investigated.
- Identify cause of non-compliance and investigate/document actions to correct safe work method deficiencies or rectify inappropriate workplace behaviors, including consultation, counselling, training and/or disciplinary action.
- Preparation and regular review of work procedures.

All Honeywell Employee Responsibilities

Employees have a duty to cooperate in the achievement of a safe and accident free workplace, through:

- Cooperating in fulfilment of the obligations placed on Honeywell International.
- Identify all tasked and prepare risk assessments.
- Working with care for their own safety and that of others who may be affected by their actions
- Reporting unsafe conditions and behaviours.
- Wear and maintain any issued personal protective equipment (PPE) when necessary.
- Assisting in the investigation of any accidents with the objective to prevent recurrence.
- Maintain a safe working environment for all Honeywell/Contractor employees that may be utilized for this project.
- Report all safety issues or events directly to the Honeywell Project Manager.

Subcontractors shall be responsible for complying with all Subcontractor Responsibilities

Subcontractors shall be responsible for complying with all statutory obligations and shall exercise all possible care for the health and safety of their personnel and other persons at the workplace who may be affected by their activities. Subcontractors shall at all times comply with Honeywell's HSE policy and procedures. As a condition of employment all employees are expected to work in a safe and responsible manner. The employee is ultimately responsible for his or her own safety. All contractors shall provide the employee with all the necessary training and PPE, but the employee must make the proper choices when performing an assigned task. Any issues not covered by this Safety Plan should be communicated to the relevant Honeywell representative. The Contractor's personnel will have responsibilities, which include but may not be limited to the following:

- Establishing safety responsibilities for their site personnel including their subcontractors.
- Insisting and ensuring correct and safe practices are used at all times.
- Providing adequate resources, personnel, equipment, time and funds to ensure the objectives of the safety plan are met.
- Completing the required work authorization forms and safety permits for each activity.
- Following safety rules and verbal instructions. Ask superintendent questions when any uncertainty exists.

- Ensuring their site personnel are suitably trained to effectively carry out their HSE responsibilities.
- Using tools in a safe and appropriate manner in accordance with their design; inspecting them for damage prior to each use.
- Ensuring safety auditing and performance reporting requirements specified by Honeywell are met.
- Reporting any unsafe acts or conditions, correcting them whenever possible.
- Reporting all injuries, incidents and near misses immediately, no matter how minor.

Project Employee/Contractor List

The Honeywell Project Manager will maintain the **Attachment 3 Site Project Contractor/Employee List**. All Contractors and Honeywell Employees working on site, listed or not, have a duty to cooperate in the achievement of a safe and accident free workplace.

10. Site Facilities

Honeywell Designated Areas

All designated Honeywell areas, if any, at the customer site must be maintained by Honeywell staff to ensure these facilities are kept in a clean and hygienic condition for the duration of the contract. At a minimum, these areas are to be inspected weekly to identify any workplace hazards or risks and to ensure minimum standards are maintained. If there is a Honeywell office you are required to post the Honeywell Commitment Statement and Cardinal Safety Rules. Depending on local or federal requirements ensure regulatory postings are current.

Security

Honeywell employees must meet all customer security requirements. This may include visitor badges, access training, appropriate regulatory and/or customer documentation, background checks, registry upon arrival and departure, etc. Badges are to be worn above the waist and in a visible position at all times while on site.

11. Honeywell Staff Training

Training needs shall be identified and training delivered to ensure that the project and service managers have the appropriate health, safety and environmental management skills. Honeywell employees shall be instructed in safe systems of work to ensure they work with proper regard for the safety, health, and protection of themselves, others and the environment. The Honeywell Project Manager is responsible for identifying the specific training requirements of their team members and ensuring the required training is undertaken. This training may be either Honeywell internal training, or training specific to the project location provided by the customer, provided the minimum content requirements are met. The minimum required training for the project scope of work is listed in Section 3 of this safety management plan.

12. Contractor Work Authorization & Permits

Contractor Sign-in & Work Authorization

Contractors must complete the Contractor Safety Declaration and Work Authorization Form with required risk assessments and permits prior to commencing work. Low risk work can be undertaken by contractors without direct authorization given that the relevant Honeywell Project Manager is aware of the:

1) Scope of work.
2) Time the work is to be undertaken.
3) Workers performing the work.

Attachment 4: Contractor Safety Declaration & Work Authorization Form
Attachment 5: Safety Permit Applications

13. Accident / Incident Events

Reporting of Accident / Incident Events

Honeywell Employees & Contractors must adhere to the following reporting requirements,

(1) Globally contact the Honeywell Project Manager
(2) Honeywell employees only - Call the HSE Hotline at 1-866-466-1765
(3) Honeywell Project Manager will contact the customer safety manager if required.
(4) The Honeywell HSE Manager must be contacted should any of these events occur.
    a. All injuries and incident events
    b. Release of dangerous goods or hazardous substances to the environment
(5) Certain incidents must also be reported to the relevant local workplace safety or environmental protection authorities in accordance with local legislation.

Honeywell Internal

Incident Investigation of Accident / Incident Events

Honeywell Representative must follow the following criteria after an accident or incident occurs.

(1) Conduct an incident investigation in accordance with Honeywell injury and incident investigation requirements in consultation with the regional HSE manager and affected employee(s).
(2) Ensure implementation and close out of short and/or long-term corrective actions to prevent re-occurrence.
(3) Present to Honeywell Project Management Leader and HSE Manager all planned corrective actions.

Attachment 6: Incident Investigation Report

14. Safety Observation System Events

Safety Observations must be submitted to the Honeywell Project Manager by any Honeywell employee using the **Attachment 7 Safety Observation Form**. Safety Observation is an unplanned event or condition that could have reasonably resulted in personal injury or illness, equipment or property damage, an environmental excursion, or when a safety control measure is challenged or ignored.

15. Site Evacuation Procedures

The Honeywell site specific **Emergency Response Plan, Attachment 17** shall be prepared, if a customer equivalent response plan is not available. The Honeywell Project Manager shall review and incorporate the emergency response plan into the Safety Management Plan. Either the Honeywell or Customer site specific emergency response plan shall be followed and this plan shall be communicated to all Honeywell employees, contractors, and visitors prior to working at the project site. For any Honeywell-occupied spaces such as a job trailer, leased office space or warehouse used during the course of a project, Honeywell shall complete a Honeywell site specific Emergency Risk Assessment by checking the appropriate boxes, then complete a site specific Emergency Response Plan as explained in the Emergency Response Procedure.

SECTION 2 – SITE RISK ASSESSMENT TOOLS

16. Hazard Reporting

It is the responsibility of all employees to immediately report any unsafe act or condition to the Honeywell Project Manager. Honeywell actively encourages all employees and contractors to report hazards. The strength of our Health, Safety Management Plan relies on the ability of Honeywell employees and contractors to report hazards. At each site, all hazards that are identified by employees or contractors shall be communicated immediately to the Honeywell Project Manager. In the event that the hazard is considered significant, it must be reported immediately to the appropriate Customer representative.

17. Site Assessment Tools

Identify Site Hazards

Hazards associated with contracted scope of work shall be identified and documented in the **Attachment 8 hazard assessment site inventory**. The Hazard Assessment Site Inventory should include all identified hazards for the scope of work on this contract. The Hazard Assessment is used to prepare task and generic risk assessments or contractor authorizations.

Risk Assessment & Contractor Work Authorization Forms

Each hazard must be assessed according to the risk calculator listed on the **Attachment 9 Risk Assessment Form** to ensure the hazards are categorized as low, medium or high risks. Risk exposure to hazards in the work environment is determined by consequence and severity resulting in a low, medium or high risk level. **[**Click **HERE** for sample Risk Assessments / Safe Work Procedures.**]**

Risk assessments and contractor work authorization forms include a list of control measures which need to be developed and made readily available for the duration of the work. Hazards shall be controlled to ensure that consequent risks are eliminated or reduced as far as is reasonably practicable. Control measures shall be reviewed and monitored for their effectiveness. Continuous consultation should occur with all employees and contractors on site to ensure that hazards are identified and controls implemented.

Control measures will be selected in accordance with both established Field Risk Assessment Forms and the “Hierarchy of Control Measures” aimed at eliminating the hazard or hazardous activity. The most desirable

control measure must be selected using the control hierarchy, in this order, elimination, substitution, engineering control, administrative control and personal protective equipment.

Tasks assessed as a high risk will require notifying the Honeywell Project Manager prior to commencement of work. The Honeywell Project Manager will evaluate the task for personal safety issues. All relevant activity check sheets and permits shall be completed in advance, and applicable guidelines, procedures, and/or work instructions will be reviewed and followed prior to and during the performance of the tasks.

Both contract and site specific data should be reviewed for inclusion in the orientation process to ensure key hazards/risks and any expectations in relation to the hazard elimination/risk management are communicated to the relevant employees and contractors.

The Honeywell Project Manager shall ensure that risk assessment and contractor authorization forms are implemented where required and ensure a quality standard of service is provided. Honeywell has developed a list of safety procedures for site work that facilitate compliance to legislative requirements. After the contractor completes the work authorization form the contractor may use previously completed Honeywell and/or the customer field risk assessment forms, provided that the contractor understands the procedure and takes ownership of the field risk assessment forms. All field risk assessment forms need to be reviewed by each employee prior to commencement of work.

Field Risk Assessment Forms identified are assessed for any potential risks of personal injury or injury to others, and property damage or environmental damage. Risk Assessments are separated into generic and task specific functions. The following are only examples and do not include all tasks that may apply at the customer or Honeywell location,

- Generic Field Risk Assessment Forms include common steps that are prepared once and can be used at multiple locations,
    - Climbing a ladder, working from a scaffold, scissor lifts, aerial lifts, man lift, etc.
    - Safe driving to/from customer locations
    - Personnel safety at customer locations, including walking on site
    - Roof Work
    - Mobilization of personnel, equipment or heavy components
    - Working on operating equipment
- Task Specific Field Risk Assessment Forms are prepared for a unique task at the customer site,
    - Equipment specific Lock Out / Tag Out, of electrical, mechanical, hydraulic, pneumatic, gravity, gas tie-ins, refrigerant servicing, etc.
    - Working from heights involving fall protection
    - Demolition of Electrical Cabling, equipment, etc.
    - Working in areas (e.g., installation, demolition) with live power or active control / fiber-optic cable, including junction boxes, where there is a substantial possibility of interrupting a live circuit.

18. Site Specific Field Risk Assessment Form Inventory

The Project Manager is responsible for keeping an inventory of the completed risk assessments and contractor work authorizations for the scope of work of this contract using the table provided in the hazard assessment site survey Attachment 8. This includes specific Field Risk Assessment Forms identified as a result of the completed Risk Assessments and Contractor Work Authorization Forms. All contract personnel are required to be familiar with the procedures and when they are to be used. These procedures must be followed at all times when the identified major risk activity is performed. Full records are to be kept for every major risk activity performed.

SECTION 3 – Site Requirements, HSE Training, Licenses and Competency

19. Customer Site Orientation

General Requirements

All Honeywell employees and contractors working on the customers sites will complete the customer site orientation, if required by the customer. Honeywell contractor orientations shall be managed by the Honeywell Project Manager to ensure that all orientations, including site safety management plan requirements are received and accepted by contractors and Honeywell staff, documented as being completed, and maintained in this plan for all contract personnel as required by Honeywell.

Orientation Schedule

The following orientations must be completed:

Orientation	Orientation Frequency	Key Contact(s)
Contractor Orientation	Prior to commencement of work. Complete **Site Orientation Form Attachment 10** with contractors & their employees Prior to commencement of work. Complete **Attachment 12 Field Safety Checklist** which document potential hazards. Review Contractor Work Authorization Forms with required safety permits.	Salvatore Corcione
Honeywell Employee Orientation	1. Prior to commencement of work and annually. Complete required monthly training modules per **Attachment 11 Training Register**. 2. Document employee having completed Risk Assessment Forms with required safety permits.	Salvatore Corcione

20. HSE Training, Licenses & Certificate of Competency

Honeywell Staff, Contractors and Sub-contractors

Both Honeywell Staff and contractors are required to complete the Attachment 11 Training Register as proof of completion of the required training. Honeywell employees are required to complete **Attachment 15 Vehicle, Tool, & PPE Inspection Checklist**. Additional training requirements may be required by local regulations. If applicable, this must be verified as completed before commencing work at the site. Training must be completed prior to performing site specific task or activities. All contractors and Honeywell employees are required to be currently licensed in accordance with state and local requirements to perform the work and activities associated with the contract scope of work.

SECTION 4 – Site HSE Activity Schedule

21. Honeywell Project Manager HSE Activity Schedule

1) Conduct Safety Inspections:
    a) Attachment 12 Field Safety Checklist – Project Manager to complete prior to starting work onsite and annually.
    b) **Attachment 13 Behavioral Observation Checklist** – Project Manager to complete periodically to assess Honeywell field employees during scheduled construction.
    c) **Attachment 14 Contractor Safety Checklist** – Project Manager to complete periodically to assess Contractor safety compliance.
2) Attend Customer safety meetings and audits, as scheduled.
3) Report Safety Observations to the HSE Manager and Customer.
4) Document and approve all Risk Assessments, Contractor Work Authorizations and required safety permits.

SECTION 5 – Site HSE Performance

22. HSE Metrics

The following HSE metrics will be documented and maintained during project construction,

- Attendance at weekly contractor safety meetings.
- Number of safety audits performed and completed.
- Number (and %) of safety audit items in conformance with requirements.
- Number and types of injuries, illnesses, and safety observation events noted during the project.

SECTION 6 – Contract Forms and Tools

23. Contract Forms and Tools

Contracts Forms, Tools and Procedures

The following list includes all pertinent safety forms for the use of initiating and maintaining safe work practices as described in this Safety Management Plan. These forms are also included in the following pages of this section.

Attachment No.	Document Name	Time to Complete:	Frequency	Responsible to Complete
–	Safety Management Plan (SMP)	Start of contract	Once for each phase/contract	Honeywell PM
1	HSE Commitment Statements	Start of contract	Once with SMP	Honeywell PM (Post on-site)
2	HSE Cardinal Rules	Start of contract	Once with SMP	Honeywell PM (Post on-site)
3	Site Employee/Contractor list	Booking Date – Before Installation	Update as needed throughout project duration	Honeywell PM
4	Contractor Work Authorization Form	Booking Date – Before Installation	Update as needed throughout project duration	All Subcontractors
5	Safety Permit Applications	Before performing task that requires it.	As required throughout installation	Contractor / Honeywell Field Employees
6	Incident Investigation Report Form	Within 24 hours of incident.	As required throughout project duration	Honeywell PM
7	Safety Observation Form	Throughout Project Duration	Monthly	All Honeywell Employees
8	Hazard Assessment Site Inventory	Booking Date – Before Installation	Update as needed throughout project duration	Honeywell PM
9	Risk Assessment Form	Booking Date – Before Installation	Update as needed throughout project duration	Honeywell Field Employees
10	Site Orientation Form	Booking Date – Before Installation	Once with SMP	Honeywell PM
11	Training Register	Booking Date – Before Installation	Once with SMP	Honeywell PM
12	Field Safety Checklist	Booking Date – Before Installation	Done once for all trades, Update as needed throughout project duration	Honeywell PM
13	Behavioral Observation Checklist	Throughout installation	Monthly while Honeywell field employees are working	Honeywell PM
14	Contractor Safety Checklist	Throughout installation	Monthly while subcontractors are working	Honeywell PM
15	Vehicle, Tool, & PPE Inspection Checklist	Throughout project duration	Quarterly	Honeywell PM/Employees
16	Site Specific Emergency Plan	Booking Date – Before Install	Once with SMP	Honeywell PM

SMP Attachment 1: HSE HBS Commitment Statement

Honeywell

Sustainable Opportunity Policy
Honeywell's Commitment to Health, Safety and the Environment

By integrating health, safety and environmental considerations into all aspects of our business, we protect our employees, our communities and the environment, achieve sustainable growth and accelerated productivity, drive compliance with all applicable regulations and develop technologies that expand the sustainable capacity of our world. Our health, safety and environmental management systems reflect our values and help us meet our business objectives.

- We protect the safety and health of our employees, and minimize the environmental footprint of our operations through efforts to prevent illness, injury and pollution.
- We actively promote and develop opportunities for expanding sustainable capacity by increasing energy and water efficiency, improving security and safety, and reducing emissions of harmful pollutants.
- We are committed to compliance with all of our health, safety, environmental and legal requirements everywhere we operate.
- Our commitment to health, safety and the environment is an integral aspect of our design of products, processes and services, and of the lifecycle management of our products.
- Our management systems apply a global standard that provides protection of both human health and the environment during normal and emergency situations.
- We identify, control and endeavor to reduce emissions, waste and inefficient use of resources, including energy and water.
- We are open with stakeholders and work within our communities to advance laws, regulation and practices that safeguard the public.
- We abide by the company's own strict standards in cases where local laws are less stringent.
- Our senior leadership and individual employees are accountable for their role in meeting our commitments.
- We measure and periodically review our progress and strive for continuous improvement.

These are our commitments to health, safety, and the environment, and to creating Sustainable Opportunity everywhere we operate.

Darius Adamczyk
CEO

John Rajchert
President HBS

SMP Attachment 2: Honeywell Cardinal Rules

No Employee/Contractor may:

1. Engage in horseplay or conduct that endangers or injures employees, risks damage or actually does damage to company and/or customer property or the environment.
2. Bring into any company and/or customer site: firearms, explosives, or weapons of any type.
3. Bypass or operate equipment without guards, safety devices, or control equipment without following company and/or customer established procedures and protocols.
4. Disassemble, enter or perform servicing, changeover or maintenance on equipment without properly de-energizing and safeguarding all power sources according to the applicable lock-out/tag-out policy.
5. Violate a life safety permit procedure (confined space, hot work, line breaking and fall protection).
6. Knowingly place her/himself or another person in physical danger, conceal a safety hazard or unlawful chemical release to the environment, or fail to promptly obtain attention for a personal injury or chemical spill.
7. Possess or be under the influence of illegal drugs (not prescribed by a Physician of for their own use) or alcohol while on a customer site, company-owned and/or company-operated facility.

The actions listed above have been found to have such great potential for serious injury or damage that any employee that engages in such actions may be subject to discipline, up to and including termination from the company or removal from the project site, regardless of previous performance. This policy is intended to protect the employee and his/her co-workers.

All employees are expected to understand and adhere to these Cardinal Rules and to request assistance in questionable situations. Further, all employees are encouraged to question the safety and environmental performance of all operations and become involved in improving them.

Project Manager Signature: _____

SMP Attachment 3: Site Employee Contractor List

Badge #	Employer	Name	Phone Number	Supervisor

SMP Attachment 4: Contractor Safety Declaration & Work Authorization Form

Contractor Safety Declaration

As a duly authorized and designated representative and agent of _____ , hereafter called “Contractor/Subcontractor”, I hereby certify and agree for myself and for and on behalf of Contractor /Subcontractor:

I have visited the project site _____ and visually inspected the general and local conditions which could affect the Contractor /Subcontractor Work. Any failure of the Contractor /Subcontractor to reasonably ascertain from a visual inspection of the site, the general and local conditions which could affect the Contractor /Subcontractor Work, will not relieve the Contractor/Subcontractor from its responsibility to properly complete the Contractor /Subcontractor Work without additional expense to Honeywell. In addition, I have read and agree to comply with all the Terms and Conditions as specified in the written contract.

1. I have already instructed or will immediately instruct all such agents and employees with respect to such conditions and/or hazards and the proper safety precautions to be observed in regard there to;

2. I certify that all necessary, adequate and operative protective clothing and equipment have been or will be immediately issued to all such agents and employees, together with full instructions and training for their use at Contractor’s cost;

3. I certify that all Honeywell Safety and Work Specific procedures as specified in the Honeywell Contractors Safety Guide, including those addressing employee personal protective equipment (PPE), Life Critical Tasks and tool and equipment requirements will be put into effect; and that all such agents and employees will be properly supervised to insure compliance in the use of PPE, procedures and equipment and in the strict observance of safety rules and regulations;

4. I certify that all such agents and employees have completed the identified and required training and that proof of such training has been submitted to Honeywell representative. If such identified training has not been completed I agree to complete such training as identified and required to a standard equivalent or exceeding Honeywell standards.

5. I certify that I will participate in the Honeywell program to observe and monitor all such agents and employees for compliance to specified Safety Procedures and work practices as defined or required by any and all governmental regulations and laws.

6. At a minimum, I certify that Contractor /Subcontractor employees have been trained and/or briefed for the following applicable programs (identified with x), in accordance with local laws/regulations,

__ General safety rules and regulations
__ Specific safety requirements
__ Confined space entry
__ Eye and face protection
__ Hearing protection
__ Burning, welding and cutting
__ Utility line hazards/precautions
__ Chemical line hazards/precautions
__ Workplace chemical hazards
__ other (specify)

__ General protective clothing and equipment requirements
__ Lockout and tagout
__ Line breaking
__ Excavation
__ Respiratory protection
x_ Honeywell Contractor HSE Guide
_____
_____
_____

Date: _____ _____
Signature of Contractor’s/Subcontractor’s Representative

Date: _____ _____
Signature of Honeywell Representative

Honeywell Use Only: **HID #:**

PRELIMINARY SAFETY DETAILS				*Honeywell Use Only: Work Authorization Form Expiry : (Max 12 months) HSE Signed:*	
Site		Contractor		Phone	
Name (PM responsible for the work)		Job / PO / SR Number			
Names of other workers		Honeywell Project Manager			
Scope of Work		Project Duration			
Location of Work					
1. Will you be using sub-contractors?	Yes □	No □	*You must inform the Honeywell Works Supervisor of all sub-contractors you intend to use.*		
2. Are all workers inducted to site & aware of first aid & emergency procedures?		Yes □	No □→	*If **No**, Do Not Proceed. Contact The Honeywell Project Manager*	
3. Are workers familiar with the work area and specific hazards in the work area(s)?		Yes □	No □→		
4. Are tools, plant and equipment in good order (plant maintained, electrical equip. tagged, etc)?	No Plant/Tools□	Yes □	No □→		
5. Are workers aware of the safety requirements for the job & licensed where required?		Yes □	No □→		

If the Scope of Works changes Honeywell must be contacted prior to undertaking the new works

HAZARD ID, RISK ASSESSMENT & CONTROLS

Identify the Hazards ✓ **applicable**	**Assess the Risk** ✓ **applicable**	When assessing risks use these risk levels:	Minor Potential for minor injury / first aid treatment Moderate Potential for lost time injury / medical treatment Major Potential for death or serious injury
		Detail Risk Control Measures to Be Used	**Responsible Person**
□ Exposure to live electrical circuit	**Major*** □	List controls to eliminate or minimize risks.	List who is responsible for ensuring the controls are in place and are
□ Fall > 1.8m	**Moderate*** □	Refer to relevant procedure or JSA.	
□ Line Breaking	**Minor** □		
□ Confined Space Entry			
□ Asbestos			
□ Traffic / Mobile Plant			
□ Chemicals / Fumes / Dusts			
□ Noise / Vibration			
□ Public exposure to hazards			
□ Spill to Environment			
OTHER			

** Detail Risk Controls & Responsibilities. Direct Authorisation required from the Honeywell Work Supervisor prior to commencing works.*

MANDATORY SAFETY PERMITS & SYSTEM ISOLATIONS

Safety Permits must be obtained and approved before commencing the following works. If not listed below use "other" section. (✓ applicable):

Other (not listed) — List any Risk Control Safety permits not listed below here.

□ Hot Works	□ Live Electrical	□ Confined Space Access	□ Line Breaking	□ Roof/Ceiling Access	□ Equipment Isolation	□ Fire / EVAC Impairment	□ Penetration in fire rating material

6. Will the work cause interruption/isolation of site utilities (water, gas, electricity)?	No □	Yes □→	*If **Yes**, contact the Honeywell Works Supervisor*
7. Will you need to isolate systems or services (medical gas, UPS, security, comms, etc)?	No □	Yes □→	
If Yes to Q7 or Q8, what is the extent and impact of the isolation(s) / interruption?			

CONTRACTOR DECLARATION

I confirm that all necessary Health, Safety and Environment protection measures and precautions as detailed in this form will be taken to ensure the health and safety of workers and others who may be affected by the work. I also confirm the workers undertaking this work are competent, and where required, licensed to carry out the tasks.

Contractor Signature		**Date**	

SMP Attachment 5: Safety Permit Applications (Contractor & Honeywell Employee)

The permits listed below are required when called for by a risk assessment or contractor work authorization and must be documented and kept with the SMP. Permits not included or shown below may still be applicable, as determined by the Honeywell PM. Contractors may also use their own permits if approved and accepted by Honeywell PM.

Line Breaking, roof/ceiling access, Equipment Isolation, Fire/EVAC Impairment, Penetration in Fire Rated Material, Others

(Click on images below for PDF file attachment)

Hot Work Permit

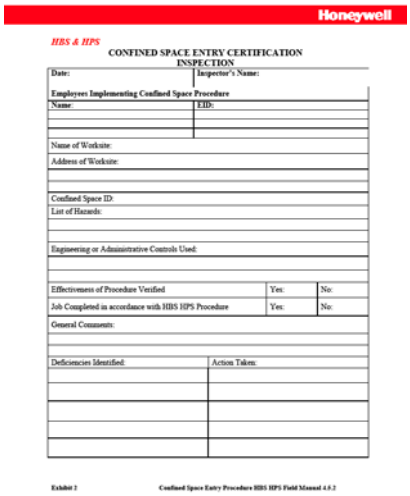
HONEYWELL HOT WORK PERMIT

WARNING! HOT WORK IN PROGRESS WATCH FOR FIRE!

BEFORE INITIATING HOT WORK, ENSURE PRECAUTIONS ARE IN PLACE!
MAKE SURE SPRINKLERS ARE IN SERVICE AND FIRE EXTINGUISHERS ARE READILY AVAILABLE!

A Hot Work Permit is required for all operations involving open flame or producing heat and/or sparks, to include, Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch-Applied Roofing, and Welding.

Confined Space Permit & Cert.


Honeywell

HBS & HPS

CONFINED SPACE ENTRY CERTIFICATION
INSPECTION

Date: Inspector's Name:

Employees Implementing Confined Space Procedure

Name: EID:

Name of Worksite:

Address of Worksite:

Confined Space ID:

List of Hazards:

Engineering or Administrative Controls Used:

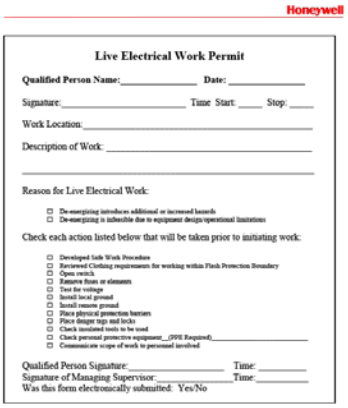
Effectiveness of Procedure Verified	Yes:	No:
Job Completed in accordance with HBS HPS Procedure	Yes:	No:

General Comments:

Deficiencies Identified:	Action Taken:

Exhibit 2 Confined Space Entry Procedure HBS HPS Field Manual 4.0.2

Live Electrical Permit


Honeywell

Live Electrical Work Permit

Qualified Person Name:_____ Date: _____

Signature:_____ Time Start: ____ Stop: ____

Work Location:_____

Description of Work: _____

Reason for Live Electrical Work:

- ☐ De-energizing introduces additional or increased hazards
- ☐ De-energizing is infeasible due to equipment design/operational limitations

Check each action listed below that will be taken prior to initiating work:

- ☐ Developed Safe Work Procedure
- ☐ Reviewed Clothing requirements for working within Flash Protection Boundary
- ☐ Open switch
- ☐ Remove fuses or elements
- ☐ Test for voltage
- ☐ Install local ground
- ☐ Install remote ground
- ☐ Place physical protection barriers
- ☐ Place danger tags and locks
- ☐ Check insulated tools to be used
- ☐ Check personal protective equipment (PPE Required)_____
- ☐ Communicate scope of work to personnel involved

Qualified Person Signature:_____ Time: _____

Signature of Managing Supervisor:_____ Time:_____

Was this form electronically submitted: Yes/No

Lockout/Tagout Permit

Honeywell

Multi Energy Source Equipment Specific Lockout/Tagout Procedure

LOCKOUT / TAGOUT

IDENTIFICATION

EMPLOYEE:	EQUIPMENT:
LOCATION:	ID NO:
DATE:	WORK ORDER OR IJOB #

ELECTRICAL

Isolation Measure	Location of Sources (include voltage and phase)
Unplug, lock/tag plug	
Open circuit by disconnecting the power feed and lock/tag the feed	
Disable circuit using breaker – lock & tag breaker in off position	
Other (specify):	

PRESSURE (identify source: air hydraulic)

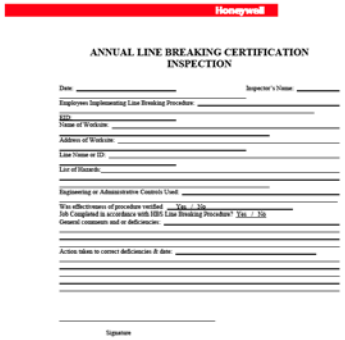
Isolation Measure	Location (of supply valve, hose, etc.)
Disconnect supply hose, lock/tag, bleed	
Close valve, lock/tag, bleed	
Double block, lock/tag, and bleed supply line	
Install blind, lock, tag, and bleed supply line	
Other (specify):	

STORED ENERGY (identify source: battery mechanical thermal other _____)

Isolation Measure	Location and Description of Source
Cool, lock/tag	
Insulate, lock/tag	
Block and lock/tag	
Disconnect battery, lock/tag	

Supervisor Name: _____

Line Breaking Permit & Cert.


Honeywell

ANNUAL LINE BREAKING CERTIFICATION
INSPECTION

Date: _____ Inspector's Name: _____

Employees Implementing Line Breaking Procedure: _____

EID: _____

Name of Worksite: _____

Address of Worksite: _____

Line Name or ID: _____

List of Hazards: _____

Engineering or Administrative Controls Used: _____

Was effectiveness of procedure verified Yes / No

Job Completed in accordance with HBS Line Breaking Procedure? Yes / No

General comments and or deficiencies: _____

Action taken to correct deficiencies if done: _____

_____

Signature

SMP Attachment 6: Incident Investigation Report – Filed per Occurrence

Part 1: BASIC INFORMATION (Complete and return to HBS HSE within 24 hours)		
Name of person reporting (if not the Supervisor)	Date of report	
Name and address of location	Region/Business Site Code (LID)	Supervisor's name Supervisor's telephone number

Claimant / Accident Information			
Full Name of injured party Employee ID #	Address of injured party Home phone: Work phone:		Is the injured party ☐ Male ☐ Female
	Employee's typical work schedule:		
Date of Hire Job title Employment status	Days worked ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐ Sun	Time begins/ends to work	Contractor? ☐ Yes ☐ No If YES, please complete: Name and address of Temporary Agency/ Contractor: Contact: Phone number:

Date of accident Time of Accident ☐AM☐ PM	Employer notified on what date	Name of place where incident occurred Address where incident occurred	Was there lost time? ☐ Yes ☐ No If yes, Last day worked
Briefly describe the incident			

Were authorities contacted? (police, fire, ambulance) ☐ Yes ☐ No If YES, who	Was a report number given? ☐ Yes ☐ No If YES, list number
Were any safeguards provided? ☐ Yes ☐ No Were they in use at the time of the incident? ☐ Yes ☐ No	
NATURE OF INCIDENT:	
TYPE OF INCIDENT:	
PART OF BODY:	

Medical Care Information	
Name and address of treating physician	Name and address of treating hospital/clinic
Phone number of treating physician	Phone number of treating hospital/clinic
Date employee first visited the doctor	What treatment was given (please check)
Describe diagnosis / medical treatment the doctor provided (List prescribed medications if any)	
Physical restrictions noted by the medical provider during the initial visit?	

Witness Information	
Name and address of a witness to the incident	Phone number where witness can be reached
Comments from witness Nº 1	
Name and address of a witness to the incident	Phone number where witness can be reached
Comments from witness Nº 2	
Anything related to the incident you would like to add	

Part 2: INCIDENT INVESTIGATION (Complete & return to the HBS Regional HSE Leader within 5 days)	
Root Cause Analysis	
Why did the incident happen? (Direct Cause)	
Why did this occur? (Contributing Cause)	
Why did that occur? (Contributing Cause)	
ADDITIONAL COMMENTS:	
PRIMARY ROOT CAUSE:	
SECONDARY/CONTRIBUTING ROOT CAUSE(S)	
Please explain or if additional information is meaningful, please describe:	

List corrective and preventative actions:

Corrective Action	Responsible Person	Target Date	Completion Date

SMP Attachment 7: Safety Observation Form

SAFE OBSERVATION SYSTEM (SOS) REPORT FORM

A SOS is an unplanned event or condition that could have reasonably resulted in personal injury or illness, equipment or property damage, or an environmental excursion. Some examples include: Unsafe Conditions, Unsafe behavior, Events where injury could have occurred but did not, Events where property damage resulted or could have resulted, Events where a control measure was challenged or ignored.

1	SOS Title:						
2	Reporting Employee Name:			Employee EID:			
3	Name of Person responsible for closure:			Employee EID:			
4	Supervisor name:			Supervisor EID:			
5	Name of Contract	Contract Number		6	Address:		
7	Describe the SOS (what happened) / (Do *not use individual names if you have seen an unsafe practice*):						
8	Honeywell HBS	9	Country: America	10	Region:	11	State:
12	Date SOS Observed:	DD/MM/YYYY					
13	Or select only one recommended time period for closing corrective action:	☐ One week ☐ Two weeks ☐ One month ☐ Three months ☐ Six months ☐ Twelve months					
14	Describe the corrective action:						
15	Date SOS to be closed (meet AOP goal):	DD/MM/YYYY					
16	Consequence of occurrence (select only one):	☐ Catastrophic (fatality) ☐ Major (hospitalisation) ☐ Serious (medical treatment/recordable) ☐ Minor (first aid) ☐ Negligible		17	Likelihood of Recurrence (select only one):	☐ Almost certain (>2 times/year) ☐ Highly likely (once per year ☐ Likely (once every three years) ☐ Unlikely (once every five years) ☐ Remote (once every ten years)	
18	Type of Hazard: (select only one):	☐ Contact in / between / under ☐ Contact with electricity ☐ Contact with sharp object ☐ Exposure to chemical (gas, dust, fume) ☐ Exposure to extreme temp. (hot/cold) ☐ Exposure to noise ☐ Exposure to low oxygen				☐ Fall from elevation ☐ Lifting / Repetitive Motion / Ergonomic exposure ☐ Liquid Splash / Contact struck against ☐ Slip / Trip / Fall (same level) ☐ Struck by ☐ Vehicle ☐ Another kind of hazard	
19	Type of SOS (select only one):	☐ Unsafe Behavior	☐ Unsafe Condition	☐ Incident with property damage		☐ Incident without property damage	
20	Location of Safety Observation (select only one):	☐ Manufacturing plant / Mill ☐ Honeywell Office ☐ Customer Office ☐ Hospital ☐ School ☐ Mechanical Room				☐ Laboratory ☐ Residence ☐ Warehouse ☐ Roof ☐ Computer Room / Control Room ☐ Vehicle ☐ Other	
21	Honeywell Risk Calculator (select only one):	☐ Major		☐ Moderate		☐ Minor	
22	Status:	☐ Open		☐ Closed			
23	Manager / Lead Signature:			Date:	DD/MM/YYYY		
	REMEMBER SAFETY IS EVERYONE'S RESPONSIBILITY						

SMP Attachment 8: Hazard Assessment Site Inventory

The following table lists each of the completed contractor work authorization forms and risk assessments for the scope of work of this contract.

HID#	Description of Hazard, Location, Safety Permits Required	Original Date	Check which is applicable below		Review Date
			Contractor Authorization Form	Risk Assessment Form	
1	Vehicle Use	11/28/18	X	X	
2	Walking through a Construction Site	11/28/18	X	X	
3	Personal Protective Equipment (PPE)	11/28/18	X	X	
4					
5					
6					
7					
8					
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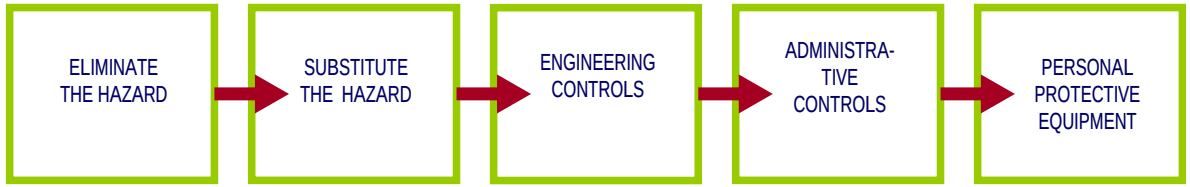
25					

Honeywell Internal

SMP Attachment 9: Field Risk Assessment Form

FIELD RISK ASSESSMENT FORM CRITERIA / CALCULATOR

Hierarchy of Controls



Cut panel wood off site	Replace ladder with scissor lift	Physical barrier / exhaust ventilation	Written procedures / Work instructions / etc.	Hearing Protection, Hard Hats, Gloves, etc

HONEYWELL RISK ASSESSMENT CALCULATOR

SEVERITY / CONSEQUENCE

PROBABILITY / LIKELIHOOD	1. Negligible	2. Minor	3. Serious	4. Major	5. Catastrophic
5. Almost Certain	Medium	High	High	High	High
4. Highly Likely	Medium	Medium	Medium	High	High
3. Likely	Low	Low	Medium	Medium	High
2. Unlikely	Low	Low	Low	Medium	High
1. Remote	Low	Low	Low	Medium	Medium

Severity / Consequence Criteria	Probability / Likelihood Criteria
Catastrophic ❑ Injury: Fatality of employees, contractors or the public. (Tier 1) ❑ Environment/Assets: Irreversible contamination of environment; Significant damage to building/equipment integrity. ❑ Public Relations: Significant public interest, national and/or international media involvement or significant impact on business reputation. ❑ Law and Permits: Federal regulatory intervention and/or regulatory fines greater then $5M to the company/unit; Government withdrawal of permits to operate the entire Honeywell unit or project.	**Almost Certain** 5. Occurred or likely to occur many times.
Major ❑ Injury: Extensive injury or Hospitalization of employees, contractors or the public. (Tier 2) ❑ Environment/Assets: Reversible contamination of environment; Moderate damage to building/equipment integrity. ❑ Public Relations: Moderate public interest, regional media involvement or moderate impact on business reputation. ❑ Law and Permits: Regional/District/State regulatory intervention and or regulatory fines greater then $1M to the company/unit; Government suspension of permits to operate a project.	**Highly Likely** 4. Occurred or likely to occur several times.
Serious ❑ Injury: Medical treatment of employees, contractors or the public. (Tier 2) ❑ Environment/Assets: Reversible small contamination of environment; Minor damage to building/equipment integrity. ❑ Public Relations: Some public interest, local media involvement or some impact on business reputation. ❑ Law and Permits: Local regulatory intervention and/or fines less then $1M to the company/unit; Customer suspension of some permits to a daily operation or written warning to Honeywell or project management.	**Likely** 3. Occurred or likely to occur once.
Minor ❑ Injury: First-aid treatment or Safety Observation of an employee, contractor or a member of the public. (Tier 3) ❑ Environment/Assets: No contamination of environment, no breach of law and no damage to building/equipment integrity. ❑ Public Relations: Little public interest, local media involvement or little impact on business reputation. ❑ Law and Permits: No suspension of permits to operate, continue daily operations, verbal warning to Honeywell or project management.	**Unlikely** 2. Might occur or likely to occur.
Negligible ❑ Injury: No injury. ❑ Environment/Assets: No impact. ❑ Public Relations: No public interest, local media involvement or no impact on business reputation. ❑ Law and Permits: No impact.	**Remote** 1. Rarely occurs.

RISK ASSESSMENT GUIDELINES

In most instances, moderate and major risks to health and safety can be adequately managed using site specific safe systems of work. For example, if a safety harness is specified as the control measure for working at height the risk assessment form should specify the pre-use inspections, selection of proper anchorage points, training of wearers, rescue of a suspended worker, etc.

For work with plant and substances consideration must be given to any safety recommendations of the manufacturer (e.g. the MSDS).

The actual workers performing the task should participate in all steps of the risk assessment process. It is crucial that the workers involved in the activity have input in the development and review of the safety measures.

Remember.
1. The risk assessment provides a written record of the process to be used to carry out a task safely. To demonstrate mutual understanding, it should be signed off by the parties who have responsibility for the tasks.
2. Management processes must be in place to ensure workers are competent and have the skills to complete the job and that there is a required level of supervision to ensure the tasks are completed as documented.
3. The risk assessment should be completed by all employees involved in the activity, not just the principal contractor or supervisor.

Describe the Site and the Scope of Work (Job Task)

The risk assessment should contain a brief description of the scope of work, location, supervisor, contractors, date & revision date where relevant.
Details of the specific area where the work is to be performed should also be included with the site details (e.g., building 1, phase 1 etc)

Document the Hazards that Make up the Scope of Work (Job Task)

In consultation with the persons performing the work, write down the hazards required to perform the scope of work/job task in the order to be carried out.
Details of the equipment and tools to be used should also be included. (e.g., fixing cabling to metal frame in roof space using an explosive powered ramset gun).

Identify Harm from Exposure to the Hazard

For each hazard, identify the harm/injury that may be caused from exposure to the hazard (s) to those engaged in the task or to others in the vicinity. For example, the main hazards from drilling concrete include exposure to hazardous silica dust, flying debris, high torque of tools and noise. The respective consequences would typically include respiratory damage, hearing damage, eye damage, sprains or cuts.
Pay particular attention to the use of plant and power tools to ensure that all safety hazards are identified.
For mobile plant check the general plant risk assessment record/Work instructions, as this will provide specific information on potential hazards associated with the plant.

Document all the Existing Risk Control Measures Associated with the Hazard to Eliminate / Reduce Risk

List all the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures). Control measures include training, instructions, information and supervision. For each hazard assess the foreseeable level of risk using the Honeywell risk assessment calculator.

Also include cross reference in the control measure column to any other risk assessments undertaken as part of the task, by referring to relevant hazard assessed (i.e. manual handling of ladders).

Risk Control Measures

Risk control measures should be selected in consultation with the relevant workers, making reference to the Honeywell HSE procedures where applicable. It may be necessary to seek advice from persons with safety training, working experience & the relevant Safety Advisor to identify the most appropriate control measure.
When selecting control measures consider:

- All persons that may be affected by the hazard, not just those involved in performing the task.
- The actual work practices on site.
- How often and for how long people are exposed to the hazard.
- The experience of workers doing the task.
- Safe work methods available and their effectiveness.
- The degree of safety training & instruction required (e.g. Safety inductions, safe work procedures, PPE use, use of MSDS's or the amount of supervision required).

Document Risk Level

Using the Risk Calculator, perform a risk assessment: evaluate the potential severity and probability (1, 2, 3, 4 or 5) of an incident for each hazard associated with the task.

Use the Risk Matrix to establish the risk ranking for each Task and Hazard; based on the Severity and Probability of an event, determine Low, Medium or High risk
Low Risk (green): Adhere to current hazard controls
Medium Risk (yellow): Control plan requires cell supervisor approval. Task should only proceed once the controls are in place
High Risk (red): Control plan must be reviewed and approved by the supervisor and site HSE. Work should not proceed until all the controls are in place and verified. High risk tasks must also be added to site Risk Assessment tool. Activities should take place to lower risk classification.

List in priority order any additional control measures required to eliminate or reduce the hazard to the lowest exposure level possible relevant to the Hierarchy of Control.

Hierarchy of Risk Control Measures

Select control measures from the highest level practicable in levels 1 to 5 below, e.g., first try to eliminate the hazard, as this gives the best result. The measures at the lower levels are less effective and require training of workers plus frequent review of the hazards and systems of work. In some situations a combination of control measures may need to be used.

1 - Eliminate the hazard
Discontinue the activity or stop using the plant, tool or substance where practicable.
2 - Substitute the hazard
Use something safer or change the system of work
3 - Engineering controls
Use guards, fencing, safety screens, etc to separate workers from the hazard, use dust extractors on tools or exhaust ventilation to reduce dust
4 - Administrative controls.
e.g. specific worker instructions or procedures.
5 - Personal protective equipment (PPE).
Only when level 1 - 4 control measures have been considered and applied to the highest extent practicable, any remaining risk may be reduced by using PPE such as safety harness, eye protection, hearing protection, etc.

Any specific training, permits and information needed to carry out the task safely should also be noted (e.g. work at height training).

Identify Who Is Responsible

Document the names of the person's responsible for implementing the control plan (additional controls/information) to lower the risk level.

Monitor and Review the Risk Assessment

Make sure the work is supervised to ensure that the work is carried out as documented in the risk assessment.
Review the risk assessment if conditions, location, etc of the work change or after an appropriate length of time. Consider also:

- Whether the control measures are suitable for the task.
- The degree of support it has amongst the employees concerned.
- The effectiveness of control measures.

Designated Major Risk Tasks

Major risk work includes, but is not limited to:

- Unprotected work at heights >1.8 meters / 6 feet, particularly on roofs.
- Working on ladders above 1.8 meters / 6 feet.
- Entering confined spaces.
- Live electrical works.
- Working with mobile plant and machinery.
- Working near power lines.
- Working with elevating work platforms and cranes.
- Trenching and excavation.
- Work on or near gas mains or electricity supplies.
- Working with/near asbestos or lead or their removal.
- Demolition.
- Using certain hazardous substances including carcinogens.

Assessing and Reviewing Subcontractor Risk Assessments

The team leader/project manager or their delegated representative should ensure that the adequacy of subcontractor risk assessments and any associated safety documents and instructions are assessed prior to commencing work. In assessing subcontractor risk assessments consider the following:

- Compliance with Honeywell's policies and procedures.
- Has the recommended process been followed to develop the risk assessment?
- Are foreseeable significant hazards and risks to health and safety identified in relation to the nature of the works, including plant, tools and equipment used?
- Are risk control measures adequate and in line with the hierarchy of controls?
- Are all legislative requirements satisfied?
- Has the subcontractors inducted their workers into their own risk assessment?
- Is there adequate provision for supervision to ensure control?

[CLICK HERE FOR LINK TO PRE-POPULATED RISK ASSESSMENTS/SAFE WORK PROCEDURES]

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION:

SCOPE OF WORK (JOB TASK):

PERMIT TO WORK REQUIRED? Yes ☐ No ☐

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
	ALL STAFF		CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES		CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY		VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR		1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Severity / Consequence

Probability/ Likelihood	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*

I have read and understood the content of this RISK ASSESSMENT and agree to follow the requirements as outlined or alternatively contact the responsible Honeywell supervisor to revise the agreement

This risk assessment is written and approved at an administrative level. This approval does not imply that the risk assessment is a comprehensive and accurate document. Any subsequent use of the risk assessment makes it implicit upon the user to verify the accurate sequence of events, potential hazards, risks and controls.	RISK ASSESSMENT AUTHOR (PRINT NAME)	AUTHOR'S SIGNATURE	ASSESSMENT DATE
	MANAGERS NAME (PRINT NAME)	MANAGER'S SIGNATURE	ASSESSMENT REVIEW DATE

EMPLOYEE SIGNATURES

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION:

SCOPE OF WORK (JOB TASK):

PERMIT TO WORK REQUIRED? Yes ☐ No ☐

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
	ALL STAFF		CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES		CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY		VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR		1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Severity / Consequence

Probability/ Likelihood	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE	EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION: Montville, NJ

SCOPE OF WORK (JOB TASK): Vehicle Use

PERMIT TO WORK REQUIRED? Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
X	ALL STAFF		CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY		VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR	X	1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Probability/ Likelihood \ Severity / Consequence	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Collision	M	Ensure vehicle is inspected before each use and use safe driver techniques (safe following distance, maintaining speed limit, defensive driving etc).	L	Driver
	M	Ensure vehicle has valid registration, insurance, and inspection.	L	Driver
	M	Driver must hold a valid driver's license.	L	Driver
Mechanical Failure	M	Ensure vehicle is well maintained (oil changes, tire inflation, bulb maintenance etc)	L	Driver
Unsafe road conditions	M	Plan routes ahead of time. Leave early in case traffic is encountered. Check weather to ensure road conditions are safe.	L	Driver

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RISK ASSESSMENT AUTHOR (PRINT NAME)	AUTHOR'S SIGNATURE	ASSESSMENT DATE
Michael Martoglio	Michael Martoglio	11/28/18
MANAGERS NAME (PRINT NAME)	MANAGER'S SIGNATURE	ASSESSMENT REVIEW DATE

EMPLOYEE SIGNATURES

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE

Honeywell

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION: Montville, NJ

SCOPE OF WORK (JOB TASK): Walking Through a Construction/Project Site

PERMIT TO WORK REQUIRED? Yes ☐ No ☐

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
	ALL STAFF	X	CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY		VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR	X	1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Probability/ Likelihood \ Severity / Consequence	1. Negligible	2. Minor	3. Serious	4. Major	5. Catastrophic
5. Almost Certain	Medium	High	High	High	High
4. Highly Likely	Medium	Medium	Medium	High	High
3. Likely	Low	Low	Medium	Medium	High
2. Unlikely	Low	Low	Low	Medium	High
1. Remote	Low	Low	Low	Medium	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM / HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	EXISTING CONTROL MEASURES *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM / HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Slips / Trips / Falls at same height	**Medium**	**Identify and avoid construction activities that create slip/trip falls.**	**Low**	**Honeywell employee or contractor**
		Enter work areas where work is taped / coned off		
		Wear required PPE		
Falls from different level	**Medium**	**Review site risk assessment to avoid falls from heights, i.e. within 15 feet / 5 meters from roof edge, unguarded areas with a fall more than 4 feet / 1.1 meters**	**Low**	**Honeywell employee or contractor**
		Wear selected PPE, i.e. harness, if entering exposed areas		
Bump hazards	**Medium**	**Avoid low hanging equipment, piping, shelving, etc**	**Low**	**Honeywell employee or contractor**
		Egress slowly in areas to assess safe path of travel		
		Post signage where potential of a bump is likely		
		Wear required PPE: safety glasses, safety shoes, hard hat or bump cap		
Eye hazards	**Medium**	**Wear safety glasses in all work areas**	**Low**	**Honeywell employee or contractor**
		Wear goggles when dust is airborne or when working below the task		
		Wear face shields when exposure to liquids may splash		
Chemical hazards	**Medium**	**Avoid unknown chemicals**	**Low**	**Honeywell employee or contractor**
		Read Safety Data Sheets of chemicals you may contact or potentially be exposed too		

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	EXISTING CONTROL MEASURES *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*

Each risk assessment, including generic risk assessments, must be reviewed to ensure they are site specific.
All workers must be consulted and should sign off to verify that they understand all the requirements of the risk assessment.

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	EXISTING CONTROL MEASURES *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
		Wear selected PPE to minimize or avoid chemical exposure, if needed.		
Electrical hazard	**Medium**	**Be aware of live electrical work before entering the work area.**	**Low**	**Honeywell employee or contractor**
		Wear arc flash PPE if you are within 36 inches / 1 meter of the work activity		
		Read the lock/tag/try permit to understand control measures in the work area		
Motor or industrial vehicles	**Medium**	**Walk in areas where you are not on the same path as traffic**	**Low**	**Honeywell employee or contractor**
		Follow marked areas for egress when in the same area as traffic		
		Wear a safety vest		

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	MANAGERS NAME (PRINT NAME)	MANAGER'S SIGNATURE	ASSESSMENT REVIEW DATE

EMPLOYEE SIGNATURES

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE
EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE
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All workers must be consulted and should sign off to verify that they understand all the requirements of the risk assessment.

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION:
Montville, NJ

SCOPE OF WORK (JOB TASK):
Personal Protective Equipment (PPE) Requirements for Contractors and Honeywell Employees at Site/Customer Locations

PERMIT TO WORK REQUIRED?
Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
	ALL STAFF	X	CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY		VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR	X	1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Probability/ Likelihood \ Severity / Consequence	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
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3. Likely	Low	Low	Medium	Medium
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1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Crush hazards (Mandatory at all site/customer locations)	**M**	**Wear steel/composite toe safety shoes at all times when at the site/customer/work location.**	**L**	**Site Contractors / HON employees**
Eye hazards (Mandatory at all site/customer locations)	**M**	**Wear safety glasses with side shields in all work areas**	**L**	**Site Contractors / HON employees**
	M	**Wear goggles when dust is airborne or when working below the task**	**L**	
	M	**Wear face shields when exposure to liquids may splash**	**L**	
Bump hazards (Mandatory at all site/customer locations)	**M**	**Wear hard hat or safety bump cap, as required by site conditions when at the site/customer site**	**L**	**Site Contractors / HON employees**
	M	**Avoid low hanging equipment, piping, shelving, etc.**	**L**	
	M	**Egress slowly in areas to assess safe path of travel**	**L**	
	M	**Post signage where potential of a bump is likely**	**L**	
Noise hazards	**M**	**Wear hearing protection for nuisance noise or any noise level over 85 dBa over an eight hour continuous period.**	**L**	**Site Contractors / HON employees**
Arc Flash hazards	**M**	**Wear arc flash PPE and clothing based on the hazard category (1-4)**	**L**	**Site Contractors / HON employees**
Cut hazards	**M**	**Wear cut resistant gloves when working with metal/sharp tool(s) and cutting into metal or other hard materials that can cause hand/finger laceration. Wear appropriate/required gloves when working with chemicals or other hazards that come into contact with the hand.**	**L**	**Site Contractors / HON employees**

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION:
Montville, NJ

SCOPE OF WORK (JOB TASK):
Personal Protective Equipment (PPE) Requirements for Contractors and Honeywell Employees at Site/Customer Locations

PERMIT TO WORK REQUIRED?
Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
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HONEYWELL RISK ASSESSMENT CALCULATOR

Probability/ Likelihood \ Severity / Consequence	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Respiratory	**M**	**Wear disposable (dust) masks for nuisance dust/particulates only.**	**L**	**Site Contractors / HON employees**
	M	**Read and Sign Declaration for voluntary use. Provide copy to your supervisor and HSE Leader.**	**L**	
Arc Flash hazards	**M**	**Wear arc flash PPE and clothing based on the hazard category (1-4)**	**L**	**Site Contractors / HON employees**
Fall hazards	**M**	**Review site risk assessment to avoid falls from heights, i.e. within 15 feet / 5 meters from roof edge, unguarded areas with a fall more than 4 feet / 1.1 meters**	**L**	**Site Contractors / HON employees**
		Wear selected PPE, i.e. harness, if entering exposed areas		
Chemical hazards	**M**	**Read Safety Data Sheets of chemicals you may contact or potentially be exposed too**	**L**	**Site Contractors / HON employees**
	M	**Wear selected PPE to minimize or avoid chemical exposure, if needed.**	**L**	

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	MANAGERS NAME (PRINT NAME)	MANAGER'S SIGNATURE	ASSESSMENT REVIEW DATE

EMPLOYEE SIGNATURES

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION:
Montville, NJ

SCOPE OF WORK (JOB TASK):
Personal Protective Equipment (PPE) Requirements for Contractors and Honeywell Employees at Site/Customer Locations

PERMIT TO WORK REQUIRED?
Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED:				DURATION OF EXPOSURE:				FREQUENCY OF JOB:	
	ALL STAFF	X	CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
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3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE
EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE
EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE
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EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE
EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE

SMP Attachment 10: Orientation Form (Completed at Project Construction Kick-off)

Employee/Contractor:…… Contract: …… Date……...

Honeywell Representative:…….

Please tick ✓	Yes	No	Comments
• Honeywell/Customer HSE Policy	☐	☐	
• Discuss (or provide copies) of relevant Honeywell and/or Customer HSE procedures	☐	☐	
• Discuss/provide copy of Contractor HSE guidelines	☐	☐	
• First Aid arrangements	☐	☐	
• Location of hazardous materials listed in Hazardous Materials Register	☐	☐	
• Emergency Procedures	☐	☐	
• Evacuation Procedures	☐	☐	
• HSE Risk Assessment Worksheet	☐	☐	
• Reviewed Health and Safety Plan	☐	☐	
• Site Entry/Access requirements	☐	☐	
• Specific Training for special Area/Tasks (list below)	☐	☐	
• Works Authorization Form requirements	☐	☐	
	☐	☐	
	☐	☐	

I have completed the Orientation & Training as required for this Contract and agree to follow the guidelines and procedures as outlined in these courses.

Name	Signature	Name	Signature

SMP Attachment 10: (Completed by ALL Contractor/HW Employees prior to construction start)

I have read and understand the Risk Assessments, completed Site Orientation & Safety training as required for this Contract at (enter project name) and agree to follow all guidelines to work safely			
Print Name	Signature	Company	Date

SMP Attachment 10: (Completed by ALL Contractor/HW Employees prior to construction start)

I have read and understand the Risk Assessments, completed Site Orientation & Safety training as required for this Contract at (enter project name) and agree to follow all guidelines to work safely			
Print Name	Signature	Company	Date

Honeywell Internal

SMP Attachment 11: Training Register

The following table lists the Site Specific training requirements that must be completed prior to working on the project site. These training procedures were identified as a result of the completed hazard and risk assessments observed at the contract site. All employees and contractors must be familiar with the required training for this project and agree to follow these procedures for the entire duration of the project.

Training Register				
#	Training Requirement	Contract Required (yes or no)	Who is to Complete	Comments
1	Customer orientation	Yes	Honeywell Employees	
2	Honeywell Safety Awareness / Orientation	Yes	Honeywell Employees	
3	Asbestos Awareness	Yes	Honeywell Employees	
4	Bloodborne Pathogen Awareness			
5	Canine Awareness			
6	Cold Weather Safety			
7	Compressed Gas Awareness			
8	Confined Space Awareness	Yes	Honeywell Employees	
9	Confined Space Entry – advanced training required	Yes	Honeywell Employees	
10	Cranes & Slings	Yes	Honeywell Employees	
11	Driver Safety	Yes	Honeywell Employees	
12	Electrical Arc Flash Awareness	Yes	Honeywell Employees	
13	Electrical Safety General Awareness	Yes	Honeywell Employees	
14	Emergency Preparedness Plan (Customer)			
15	Environmental Hazard	Yes	Honeywell Employees	
16	Eye & Face Protection	Yes	Honeywell Employees	
17	Fall Protection	Yes	Honeywell Employees	
18	Fire Extinguisher Usage	Yes	Honeywell Employees	
19	Hand & Power Tool	Yes	Honeywell Employees	
20	Hazard Communication	Yes	Honeywell Employees	
21	Hearing Protection	Yes	Honeywell Employees	
22	Hot Work Permit	Yes	Honeywell Employees	
23	Ladder Safety	Yes	Honeywell Employees	
24	Laser Safety			
25	Lead Safety	Yes	Honeywell Employees	
26	Line Breaking	Yes	Honeywell Employees	
27	Lock Out/Tag Out	Yes	Honeywell Employees	
28	Machine Safeguarding			
29	Management of Change	Yes	Honeywell Employees	
30	Manual Material Handling / Back Safety	Yes	Honeywell Employees	
31	Office Ergonomics	Yes	Honeywell Employees	
32	Personal Protective Equipment	Yes	Honeywell Employees	
33	Powered Industrial Trucks	Yes	Honeywell Employees	
34	Process Safety Management			
35	Refrigerant Management	Yes	Honeywell Employees	
36	Respiratory Protection	Yes	Honeywell Employees	
37	Safety Observation System (SOS)	Yes	Honeywell Employees	
38	Safe Operations Management (SOM)Training	Yes	Honeywell Employees	
Below list other customer specific training requirements, if applicable.				
1				
2				

Honeywell Internal

SMP Attachment 12: Field Safety Checklist

Form completed by Michael Martoglio Date 11/28/18

Honeywell requires a Field HSE Check List be maintained onsite for all current or new projects. It is to be performed prior to starting work during the initial site visit. Hazards identified are to be communicated to all personnel working at the site and referenced during future visits.

Original Date: 11/28/18 Revision Date:
Contractor(s): N/A
Customer Name: Montville BOE Customer Contact: Steven Toth Address: 86 River Road, Montville, NJ
Telephone No: 973-331-7100 Customer HSE Rep: Steven Toth Phone:

1. Scope of work summary:

2. Personal protective equipment required on site?

	NO		YES (Honeywell)		YES (Contractor)
Fall Protection?	☒		☐		☐
Hard Hat?	☐		☐		☒
Safety Glasses?	☐		☐		☒
Hearing Protection?	☒		☐		☐
Safety Shoes?	☐		☒		☒
Protective Clothing? (specify)	☒		☐		☐
Respiratory protection? Explain:	☒		☐		☐

3. Safety hazards encountered at customer's facility (Check and explain plans for addressing the hazard).

Check for Yes	Safety Hazard	Name of Contractor / Personnel Performing Work	Plans to Address: Risk Assessment or Contractor Work Authorization
☐	Construction environment		
☐	High or low temperature materials or equipment		
☐	Welding		
☐	Laser equipment		
☐	Confined space or isolated work area		
☐	Overhead operations		
☒	Work at heights requiring a ladder, lift platform or basket; who provides the equipment and has appropriate training been completed?	TBD	Risk Assessment
☐	Are there areas where the following conditions are present: Oxygen deficient atmosphere, toxic gases, vapors, fumes, mists, dusts, lead, mercury?		
☐	Known or suspected carcinogens including asbestos		
☐	Potential exposure to biohazards		
☐	Explosive or highly combustible materials		
☐	Excessive noise levels (signage identifies area)		
☐	High voltage (480 volts or greater) in the work area		
☐	Radiation sources		
☐	Ergonomics: excessive bending/stooping, cramped space		
☐	Slippery surfaces		
☐	Open pits, vats, trenches		
☐	Material handling requiring hoists, cranes, rigging, forklifts?		
☐	Raw or partially treated sewage		
☐	High pressure equipment		
☐	Unguarded machinery		
☐	Hot work permits required		
☒	Lockout/tagout permits required	TBD	Risk Assessment
☐	Emergency evacuation		
☐	Special parking or security requirements		
☐	Customer hazard communication requirements		
☐	Process safety management requirements		
☐	Applicable MSDS's available; if no, who obtains them		
☐	Other hazards		

4. Specific safety considerations necessary to abide with customer's safety procedures. Building access

5. Have all employees been briefed on the customer's site emergency response and evacuation plans & how will employees be accounted for in the event of an emergency? Yes

6. Does the customer have a drug/alcohol policy for contractors and does it include drug testing? No

7. Have the employees assigned to this project received appropriate safety training to prepare them for safety issues identified? Yes

Complete, Sign and review on first visit or after work order changes. Revise annually. Review, sign & date:

Honeywell Manager	Employee\Contractor	Customer Representative (Optional)

SMP Attachment 13: Behavioral Observation Checklist (HW Employee Monitoring)

Utilize the Behavior Observation Checklist to identify both safe and at risk conditions in the work environment. After observation provide feedback to the employee for both safe and at risk observations. All at risk observations must have comments to identify corrective action or explanation. Only respond to questions that apply to the task

1. Observer

Report Observer Name

Observer EID

2. Observed

Observed Name

Observed EID

3.Task performed by Employee:_____

(4) Select SBU: HBS or HPS	(5) Select Pole (Americas or EMEA or AP):	(6) Region within Pole:	(7) State/District /Branch within Region:

(8) Location of Behavior Observation (select only one):

- ☐ Manufacturing plant / Mill
- ☐ Honeywell Office
- ☐ Customer Office
- ☐ Hospital
- ☐ School
- ☐ Mechanical Room
- ☐ Laboratory
- ☐ Residence
- ☐ Warehouse
- ☐ Roof
- ☐ Computer Room / Control Room
- ☐ Vehicle
- ☐ Other

(9) Date BOC Observed: DD/MM/YYYY

SAFE PATH OF TRAVEL			
Uses designated walkways to access work area	SAFE	AT RISK	N/A
Has clear view of path to travel	SAFE	AT RISK	N/A
PERSONAL PROTECTIVE EQUIPMENT (PPE)			
Head Protection	SAFE	AT RISK	N/A
Eye/Face Protection	SAFE	AT RISK	N/A
Hand Protection	SAFE	AT RISK	N/A
Foot Protection	SAFE	AT RISK	N/A
Respiratory Protection	SAFE	AT RISK	N/A
Electrical Protection	SAFE	AT RISK	N/A
Personal gas detector	SAFE	AT RISK	N/A
SAFE MOTOR VEHICLE OPERATION			
Does not use any mobile device while driving	SAFE	AT RISK	N/A
Secures equipment for safe transport	SAFE	AT RISK	N/A
Vehicle properly maintained	SAFE	AT RISK	N/A
Parking brake engaged when parked	SAFE	AT RISK	N/A
BODY POSITIONING DURING TASK			
Uses knees to lift not back	SAFE	AT RISK	N/A
Use knee pads when kneeling	SAFE	AT RISK	N/A
Watches hand placement / Keeps eyes on task	SAFE	AT RISK	N/A
Avoids pinch points or “line of fire” hazards	SAFE	AT RISK	N/A
Note: Line of fire: Struck by/against, caught in /between/under			
LADDERS			
Properly stores ladder on vehicle	SAFE	AT RISK	N/A
Ladders inspected prior to use	SAFE	AT RISK	N/A
Right ladder (step/extension) for the job	SAFE	AT RISK	N/A
Three points of contact at all times	SAFE	AT RISK	N/A
Does not use ladders in wet conditions	SAFE	AT RISK	N/A
Uses tool belt/back pack to carry tools	SAFE	AT RISK	N/A

PRE-JOB PLANNING			
Identifies all hazards in the work environment	SAFE	AT RISK	N/A
Conducts risk assessment using the risk calculator for	SAFE	AT RISK	N/A
Low / Medium or High Risks	SAFE	AT RISK	N/A
Obtains Work Permit where required	SAFE	AT RISK	N/A
Implements controls prior to starting work	SAFE	AT RISK	N/A
Communicates job activities with customer or team	SAFE	AT RISK	N/A
TOOLS			
Tools properly maintained	SAFE	AT RISK	N/A
Lock out, tag out properly applied	SAFE	AT RISK	N/A
Verifies zero energy after lock out	SAFE	AT RISK	N/A
Proper use of tools/ Uses right tool for the job	SAFE	AT RISK	N/A
Inspects tools before use	SAFE	AT RISK	N/A
INCLEMENT WEATHER			
Drinking plenty of fluids	SAFE	AT RISK	N/A
Taking rest breaks	SAFE	AT RISK	N/A
Uses ice cleats for icy conditions	SAFE	AT RISK	N/A
WORK ENVIRONMENT			
Keeps work area clean / free of trip hazards	SAFE	AT RISK	N/A
Checks work area for bees, wasps, snakes, etc	SAFE	AT RISK	N/A
HAZARD/INCIDENT REPORTING			
Reports Safety Observations	SAFE	AT RISK	N/A
Knows how to report injuries	SAFE	AT RISK	N/A
OTHER CRITICAL BEHAVIORS OBSERVED			
_____	SAFE	AT RISK	N/A
_____	SAFE	AT RISK	N/A

Describe At Risk Behavior:
Describe Safe Behavior:

Corrective action entered into SOS: Yes: **No:** **SOS Number:**

Manager / Lead Signature **Date** DD/MM/YYYY

SMP Attachment 14: Contractor Performance Safety Checklist (Contractor Audits)

Contractor Performance Safety Checklist

Site location:		**Location of work**		
Auditor:		**Date and time**	**Date**	**Time**
Details of work being undertaken				
Contract Number or Name				
Name of contractor				

Observed health and safety standards			**Comments**
(i) Have all contractor and sub contractor staff attended a site safety orientation course and received required HSE training?	Yes	No	
(ii) Have all contractor and sub contractor staff aware of the sites emergency procedures?	Yes	No	
(iii) Have all contractor and sub contractor staff been aware of what to do in the event of an accident and/or safety observation? (speak to contractor staff)	Yes	No	
(iv) Has the contractor made adequate first aid provision?	Yes	No	
(v) Have safety observations been submitted to Honeywell on a periodic basis?	Yes	No	
(vi) Are the contractor and sub contractor risk assessments, safe work procedures, method statements, HSE procedures, and permits to work being followed?	Yes	No	
(vii) Has required PPE, e.g. hard hats, safety boots, etc. been provided according to the risk assessment and is it being worn?	Yes	No	
(viii) Has the contractor implemented life critical control measures for fall protection, electrical safety, arc flash, and permit confined spaces?	Yes	No	
(ix) Where applicable are the contractor works securely fenced off or otherwise protected from the public, staff, etc?	Yes	No	
(x) Is the contractor maintaining a safe work area and implementing good housekeeping standards, including safe egress to roads, aisles, stairs, etc.?	Yes	No	
(xi) Is the contractor holding regular tool box talks with employees?	Yes	No	
(xii) Other observations			

Auditor: *I hereby declare that I have completed health and safety monitoring on the contractor named above*

Name (capitals)		Signature			
Job Title		Time		Date	
Contractors representatives name		Signature		Date	
Site managers name		Signature		Date	

SMP Attachment 15: Vehicle, Tool, & PPE Inspection Checklist (Honeywell Employees)

EMPLOYEE NAME:	VEHICLE #:
SUPERVISOR NAME:	VEHICLE MILEAGE:
LOCATION ID# VEHICLE ASSIGNED:	INSPECTION DATE (MM/DD/YY):

	Insp	Test	Items	OK	DEV	N/A	Deviations: Enter a brief description of deviation, action taken, and date corrected
VEHICLE SAFETY ITEMS	x		**Housekeeping -** vehicle, tools, and equipment are neat and orderly, items in driver compartment are adequately secured				
	x		**Ladder racks** - in good condition, hardware intact, operates easily, ladders secure				
	x		**Exterior/Body damage** - exterior clean and in good condition (note all damage including scratches, dents, etc.)				
	x	x	**Lights** visible and operational - headlights (low & high beam), tail lights, brake lights, emergency flashers, other lights				
	x	x	**Windshield washer system/wipers/fluid** - operating properly, good condition, appropriate fluid level				
	x	x	**Seatbelt** - available and in good condition				
	x		**Glass & mirrors** - clean, no cracks or pits in areas that obstruct driver's view, mirrors securely mounted, properly positioned				
	x	x	**Tire Condition and Pressure** - appropriate tire wear and pressure (including spare)				
	x	x	**Fluid levels -** verify that oil is full, no fluid leaks				
	x	x	**Tire Condition and Pressure** - adequate tread depth and appropriate tire wear, proper pressure (including spare)				
	x	x	**Brakes** - operating properly (per driver's verbal report), verify that emergency brake operates properly				
	x	x	**Doors & locks** - door catches and handles work properly, locks work properly and can be secured				
	x		**Fire extinguisher** - mounted within vehicle, gauge needle in "green" zone or otherwise indicates "full"				
	x		**First aid kit** - vehicle kit available and adequately stocked				
	x		**Chocks and cones -** available, as needed				
	x		**Vehicle registration, insurance card, driver's license, Honeywell driver's guide, fuel card** -present, current, available for appropriate vehicle				
LADDERS & FALL	x		**Ladders** - Rungs, rails, hardware, rope in good condition. Appropriate ladder size and type available (non-conductive ladder available when electricity could be encountered)				
	x		**Fall protection equipment** - harness, lanyard, anchoring equipment inspected and in good condition. Complete system from same manufacturer. Harness and lanyard stored properly (without twisting, bending, away from chemicals and direct sunlight). Replaced according to manufacturer guidance.				
PPE	x		**Eye protection** - readily available, clean, in good condition				
	x	x	**Hard hat** – in good condition, no cracks or dents. Cradle system intact and in good condition. Clean surface.				
	x		**Hand and foot protection** - available and in good condition				
	x		**Hearing protection** – appropriately selected, clean, in good condition, stored properly				

	x	x	**Respiratory protection** - appropriately selected, in good condition, stored properly				
TOOLS & EQUIPMENT	x		**Power tools** - in good condition; cords, plugs, prongs present and good condition; grounded or double insulated; no broken pads; guards in place; removed from service/replaced promptly if poor condition detected				
	x		**Pneumatic tools** - hose/whip secured to tool by positive means (to prevent tool from being accidentally disconnected); safety clips or retainers used on impact/percussion tools				
	x		**Hand tools** - Good condition, no mushroomed heads, no broken or cracked parts; removed from service/replaced promptly if poor condition				
	x		**Fuel-powered tools/equipment** - good condition; stored so as to prevent spilling of fuel during transport; when in use in enclosed spaces, measures are taken to prevent build-up of gases and fumes; stopped for refueling, service, and maintenance				
ELECTRICAL	x		**Extension cords** - cord and plugs in good condition (no cracks, cuts, or tape), prongs intact, cord is grounded or double-insulated (and/or GFI available)				
	x		**Lockout/Tagout** - appropriate devices available (locks, tags, hasps, etc.), appropriate variety available for job conditions				
	x	x	**Amp Meter** - clean, no damage, proper storage, good working order, test battery				
COMPRESSED	x		**Torches, hoses, regulators** - fittings in good condition, no leaks, auto shut-off tested, hoses & connections designed for pressure and service to which subjected; equipped with backflow prevention or flash arrestor				
	x		**Gas cylinders** - turned off, stored upright with caps in place, secured (to prevent tipping), properly labeled, used with appropriate PPE, regulators and torches removed and/or disconnected from cylinders when not used				
	x		**Personal Protective Equipment for Hot Work** (i.e. face shield, body protection, etc.) - protective equipment available and in good condition				
MISCELLANEOUS	x		**Outdoor/inclement weather supplies & equipment** - appropriate supplies available for hazards encountered (i.e. drinking water/fluids, snow/ice management equipment {sand, shovels, etc.], insect spray [di-electric spray required if working near electricity], sunscreen, etc.)				
	x		**Chemicals** - only “approved” chemicals used, all containers properly labeled, containers stored properly (secured). Material Safety Data Sheets (MSDS) on file at HON office. If refrigerant is distributed, logs are available and up-to-date.				
	x		**Hand lines and ropes** - no cuts, abrasions, decay, burns, signs of wear				
	x		**Portable blowers** - in good condition, proper ratings on blower, proper set-up and use (test)				
	x	x	**Air monitoring equipment (for confined space entry)** - appropriate for job conditions and hazards potentially encountered, in good condition and functioning properly, test/calibrate equipment according to requirements, appropriate calibration gases and test kit available				
	x	x	**Electrical insulating gloves (for electrical hot work) -** if used and available, ensure appropriate class/type for use, verify current inspection/test date stamp rubber protective layer (w/in past 9 mos.), stored in bag with fingers upright, stored away from direct sunlight in dedicated bag				
	x		**Electrical mats/barriers** - Mats and barriers in good condition, no tears, rips or holes. Appropriate for hazards encountered.				
	x		**Gasoline** - stored in approved flammable liquid container with self-closing lid, flame/flash arrestor. Stored to prevent tipping. Maximum capacity stored less than 5 gallons.				
	x		**Heaters** – equipped with proper shut-off (tip over protection), use only approved heaters in good condition.				
	x		**Permits** - verify adequate supply of required permits (Hot Work, Live Electrical, Permit-Required Confined Space Entry, etc.)				

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SMP Attachment 17: Emergency Response Plan

HBS Facilities Emergency Response Plan

Honeywell Business Unit:	HESG
Street Address:	115 Tabor Road
City, State, Zip:	Morris Plains, NJ 07950
Date of ERP Review:	11/28/18

Emergency Response Preparedness (ERP) Checklist: ***(Click on PDF)***

SMP Attachment 17: Emergency Response Plan

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1. EMERGENCY PREPAREDNESS PLAN SCOPE:

Honeywell International Inc. (Honeywell) will provide a safe and healthy work environment. Consistent with policy, the following emergency action plan is developed for this site and will guide the actions taken by employees, management, and emergency coordinators. Emergency events addressed by this plan include building evacuation, fires, severe weather, medical emergencies, Bomb Threats or other facility-related emergencies that could endanger employees and/or visitors to this Honeywell location.

2. HSE HOTLINE REPORTING GUIDANCE:

Report all Injuries and Illnesses and Emergency Events addressed within this reporting procedure to the **Honeywell Hotline at (866-466-1765).** Early Post Injury Reporting with Immediate First Aid measures can reduce Injury Severity & Eliminate the need for Future Medical Care (Recordable Injuries).

3. DRILLS/TEST OF EMERGENCY PREPAREDNESS PLAN:

Familiarity with responsibilities and procedures must be thorough so that response to the plan is automatic. Each location is responsible for accomplishing at least one emergency situation drill every twelve (12) months. After accomplishing the emergency situations drill it must be documented on the Emergency Preparedness Drill Critique.

4. FACILITY IDENTIFICATION, DESCRIPTION, GENERAL INFORMATION:

Office Name/LID	**Montville Administration Building**
Address	**86 River Road Montville, NJ 07045**
Description of Bldg, Usage	**Administration offices**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**Cedar Hill Elementary School**
Address	**46 Pine Brook Road Towaco, NJ 07082**
Description of Bldg, Usage	**Elementary School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**Hilldale Elementary School**
Address	**123 Konner Ave Pine Brook, NJ 07058**
Description of Bldg, Usage	**Elementary School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**Valley View Elementary School**
Address	**30 Montgomery Ave Montville, NJ 07045**
Description of Bldg, Usage	**Elementary School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**William Mason Elementary School**
Address	**5 Shawnee Trail Montville, NJ 07045**
Description of Bldg, Usage	**Elementary School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**Woodmont Elementary School**
Address	**39 Woodmont Road Pine Brook, NJ 07058**
Description of Bldg, Usage	**Elementary School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**Lazar Middle School**
Address	**123 Changebridge Road Montville, NJ 07045**
Description of Bldg, Usage	**Middle School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

Office Name/LID	**Montville High School**
Address	**100 Horseneck Road Montville, NJ 07045**
Description of Bldg, Usage	**High School**
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

5. EMERGENCY COORDINATOR INFORMATION

THE EMERGENCY COORDINATOR HAS PRIMARY RESPONSIBILITY FOR ASSURING THE IMPLEMENTATION OF THIS EMERGENCY PREPAREDNESS PLAN AND REQUIREMENTS STATED HEREIN. WHEN EMERGENCIES OCCUR, THE EMERGENCY COORDINATOR MAINTAINS PRIMARY RESPONSIBILITY FOR APPROPRIATE NOTIFICATIONS TO EMPLOYEES, HONEYWELL MANAGEMENT, MUNICIPAL EMERGENCY SERVICES (I.E. FIRE AND/OR POLICE DEPARTMENTS), AND OTHER AGENCIES OR SERVICES THAT MAY ASSIST IN MANAGEMENT OF THE EMERGENCY.

The alternate Emergency Coordinator serves in place of the Emergency Coordinator when the primary coordinator is unavailable. (It is recommended that these positions be filled with employees who are typically in the building for the majority of the workday.)

A. THE PRIMARY EMERGENCY COORDINATOR FOR THIS FACILITY IS:

Name	**Steven Toth**
Title	**Director of Facilities**
Office Phone	
Pager or Cell	**973-725-3841**
Alternate Phone	

B. THE ALTERNATE EMERGENCY COORDINATOR FOR THIS FACILITY IS:

Name	
Title	
Office Phone	
Pager or Cell	
Alternate Phone	

6. HONEYWELL CRISIS COMMUNICATION:

Major crisis situations often generate interest from the news media and require effective internal communications to address employee concerns. As soon as possible following a major crisis event, contact the Communications Leader to discuss the situation so appropriate internal and external communications plans and tools can be developed. Examples of such times where crisis reporting should be accomplished include the following:

a. Catastrophic facility damage caused by fires, storms, explosions, or earthquakes, tsunamis, accidents that may result in severe injury and threats or acts of violence or terrorism

b. Other unexpected events that have the potential to cause harm to Honeywell's employees, reputation, competitive positioning, or financial viability.

I. INTERNAL RESOURCE NUMBERS: It is always appropriate to contact the local site leader if they are not on-site at the time of the incident. Additionally, based on the nature of the event/injury it may also be necessary to contact other Honeywell personnel listed below:

	Name	Office Phone	Cell Phone
Local Site Leader(s)	Michael Martoglio		201-787-3706
HSE Leader	Sharon Arents		281-658-9313
Facilities Manager			
HR Leader			
ACS Security Director			

❖ **Additional Links**
- o Corporate Communication Policy
- o Corporate Communication Contacts

II. EXTERNAL RESOURCES / EMERGENCY PHONE NUMBERS:

	Name	Phone
Police Department	Montville Police Department	973-257-4300
Fire & Ambulance	Montville Fire Department	973-334-6330
Building Landlord/Manager		
Other		

7. EMERGENCY EVACUATION SYSTEM:

A fire alarm will be used to alert employees within the building of fire or severe weather emergency or other need to evacuate the building or to seek shelter in place. In buildings that are not equipped with audible emergency alarms, employees will be alerted to other emergencies through direct verbal communication from the Emergency Coordinator(s) and/or designated alternate.

The Emergency Coordinator or designated alternate will make physical contact with employees who have sight or hearing disabilities to ensure that they are aware of the emergency.

a. BUILDING EVACUATION:

Evacuation of employees to a rally point outside of the building or to a refuge area within the building will be enacted whenever there is a threat to their safety or health because of an emergency condition. The refuge area shall be a safe area within the building away from windows where employees can gather, for example, in severe weather. The Emergency Coordinator is authorized to enact the evacuation of a particular room, floor, or the building.

- ✓ The designated rally point is:
  Specify: Outside the main entrance of the building
  If the designated rally point is involved in the emergency, the alternate rally point will be:
  Specify: Outside the back entrance of the building
- ✓ The designated (indoor) refuge area is:
  Specify: Gymnasium
- ✓ The Emergency Coordinator and Team will be responsible for accounting for all employees, visitors and contractors. If personnel are unaccounted for after conducting the headcount at the rally point, the Emergency Coordinator will be the designated person responsible for communicating with emergency services.
- ✓ Re-entry to the building will be coordinated through emergency services and the Emergency Coordinator. In the event of an incident preventing re-entry, the Emergency Coordinator will work with senior management, Facilities, and Health, Safety, Environmental (HSE) departments to assure the safety of the building and personnel.
- ✓ Injured personnel will receive medical care through the municipality's emergency response system.
- ✓ In the event an unplanned evacuation results from an actual site emergency, the Emergency Coordinator shall ensure appropriate notifications are made to site leadership.
- ✓ A diagram or description of the evacuation routes, exit doors, rally points and refuge areas are posted:
  Specify: Near exits in the buildings
  The designated exit doors for this facility are (list exit doors).
- ✓ Know the locations of your building evacuation route, outdoor rally point, and indoor refuge area before an emergency occurs by reviewing the posted/attached instructions and/or evacuation map.

8. MEDICAL EMERGENCY:

Remember to report all injuries no matter how minor to your manager and HSE leader immediately and the **Honeywell Hotline at (866-466-1765).** *Never enter into a medical emergency area unless you are sure there are no hazards present. Scan the area visually, overhead as well, to ensure that there are no physical dangers present. We do not want to delay the initial medical emergency response nor do we want to provide additional responses to would-be rescuers. Never move or attempt to render any assistance that could impact greater injury to the already injured victim.*

The following steps to be taken in the event of an on-site medical emergency:

a. *Immediately contact First Aid personnel and dial 9-911 for assistance, such as loss of consciousness, uncontrolled bleeding, potential heart attack or stroke and give exact location and nature of the emergency.*

b. *Remember, when First Aid arrives, they are in charge. Persons in the immediate area should be limited to only those identified by the First Aid Attendant. The First Aid Person will provide direction and course of action.*

c. *If further medical assistance is required, the First Aid Attendant or designate will contact dial 911 and request an ambulance be dispatched*

9. FIRE EMERGENCY (Evacuate and call 9-911):

To protect yourself, it is important to understand the basic characteristics of fire. Fire spreads quickly so there is no time to gather valuables or make a phone call. In just two minutes, a fire can become life-threatening. In five minutes, a residence can be engulfed in flames. Heat and smoke from fire can be more dangerous than the flames. Inhaling the super-hot air can sear your lungs. Fire produces poisonous gases that make you disoriented and drowsy. Asphyxiation is the leading cause of fire deaths, exceeding burns by a three-to-one ratio.

a. Protective Measures for Fires:

- ✓ Insure smoke alarms are installed, tested and cleaned in accordance with applicable instructions.
- ✓ Ensure Fire Suppression Systems are maintained and tested in accordance with applicable instructions.
- ✓ Ensure Fire extinguishers are in place and serviceable.
- ✓ Accomplish Annual Emergency Fire Drills to prepare employees.

b. Escaping the Fire:

- ✓ Review escape routes with personnel and practice escaping from each room.
- ✓ Ensure security doors and other antitheft mechanisms that could block outside window entry are easily opened from the inside.
- ✓ Remain low to the floor (where the air is safer in a fire) when escaping from a fire.
- ✓ Clean out storage areas. Never allow trash, old newspapers, boxes or magazines to accumulate.

c. Flammable Items:

- ✓ Never use gasoline, benzene, naphtha, or similar flammable liquids indoors.
- ✓ Store flammable liquids in approved containers in well-ventilated storage areas.

d. Fire sources and smoking:

- ✓ Never smoke near flammable liquids
- ✓ Smoke only in designated smoking areas as described below:

Specify: None

Provide deep sturdy ashtrays or outdoor approved cigarette/cigar disposal cans.

e. Heating Sources

- ✓ Be careful when using portable heating sources.
- ✓ Ensure space heaters are at least three feet (1 meter) away from combustible materials.
- ✓ Ensure Portable heating devices have a tilt shutoff as well as a timer shutoff.
- ✓ Always unplug Portable Heating Devices when not in use.

f. Electrical Wiring:

- ✓ Ensure electrical wiring is not exposed.
- ✓ Never Daisy Chain extension cords.
- ✓ Inspect extension cords for frayed or exposed wires or loose plugs.
- ✓ Make sure outlets have cover plates and no exposed wiring.
- ✓ Make sure wiring does not run under rugs, over nails, or across high-traffic areas.
- ✓ Do not overload extension cords or outlets. If you need to plug in two or three appliances, get a UL-approved unit with built-in circuit breakers to prevent sparks and short circuits.

g. During a Fire If your clothes catch on fire:

- ✓ Stop, drop, and roll until the fire is extinguished.

10. TERROIST / BOMB / BIOLOGICAL / CHEMICAL / RADIOLOGICALTHREAT EMERGENCY:

a. Remain calm, listen carefully and record the following details:

- ✓ *Time the call was received,*
- ✓ *Details of the threat (Where is the bomb or When it is expected to explode),*
- ✓ *Details of the caller (voice tone – angry, joking, sarcastic, quiet, business-like),*
- ✓ *Background noise (car noise, street noise, television, radio),*
- ✓ *Time the call ended*
- ✓

b. Notify Local Police Department, Honeywell Management and Security immediately.

Bomb, Chemical and/or Biological Threat Guideline

Detailed DESCRIPTION OF CALLER'S VOICE	***Ask the below EXACT WORDS upon BOMB THREAT***
Male _____ Female_____ Young _____ Middle Aged _____ Older_____ _____ Calm _____ Nasal _____ Angry _____ Stutter _____ Excited _____ Lisp _____ Slow _____ Raspy _____ Rapid _____ Deep _____ Soft _____ Cleared Throat _____ Loud _____ Deep Breathing _____ Laughter _____ Cracked Voice _____ Crying _____Accent _____ Normal _____Familiar _____ Slurred _____Disguised BACKGROUND SOUNDS _____ Street _____ Factory _____ Animal _____ Clear _____ Voices _____PA System _____ House _____Traffic _____ Other *THREAT LANGUAGE* _____*Well spoken* _____ *Incoherent* _____Foul/ Irrational _____ Read Message?	*1. Where is the device right now?* *2. What does it look like?* *3. What kind of a device is it?* *4. Why are you doing this?* *5. What is your name?* 6. Are you part of an organization? *7. Why are you warning us?* 8. What will cause it to activate?
*Person receiving call*_____ *Time Caller hung up*_____ *Phone number at which call was received*_____ *Date*_____	

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11. HAZARDOUS CHEMICALS:

If applicable, identify and list below all hazardous chemical quantities stored on site. Otherwise state "Not Applicable" to this location.

✓ **Inside and/or outside locations: Not Applicable**
✓ **Quantities of hazardous materials:**
✓ **Physical and/or chemical hazards, i.e., asphyxiation hazards**
✓ **Hazardous material properties, i.e. flammability, toxicity. Reference location of Safety Data Sheets**

12. INTERNAL HAZARD / CONTROL MEASURES:

Include in this section any process operations that may fail during an emergency event.

Possible Failures	Emergency Control Measure Description

The following are examples of process operations that are addressed in the procedure, but do not need to be part of this section if not applicable to your location: *(Truck/railcar deliveries, transfer of materials, utilities, pollution control devices, control rooms, pipelines, control valves, ventilation systems, boilers, pressure vessels, security access controls, fire protection systems, identify existing engineering control measures to avoid release of hazardous materials).* However, if applicable, prepare emergency control measures for each potential failed process that may apply to your location.

13. EMERGENCY DRILL REQUIREMENTS

a. Annual Emergency Evacuation Drills

- ✓ *Drills must be accomplished annually and include different types of Emergency Scenarios as outlined in this Emergency Preparedness Plan*
- ✓ *Upon completion of the Emergency Evacuation Drill use the Critique Form to Document Drill.*
- ✓ *In accordance with Corporate Policy,* once the Emergency Evacuation Drill is complete, forward the Critique Form to regional HSE Manager for entry into the Corporate Event Tracking System.

b. Annual AED Emergency Drill

- ✓ *If a location has more than 200 employees an AED is required.* Before making the determination to purchase an AED, contact your Regional Safety Manager.
- ✓ Locations with AEDs must conduct AED drills at least annually on all shifts where AED trained personnel are present. These drills must be documented and must measure the actual response time.
- ✓ When AED drill response times are greater than or equal to 5 minutes, the organization must create a corrective action plan to reduce the response time to less than 5 minutes. *This action plan must be documented in the Corporate Event Tracking System by the HSE Manager*. Corrective actions must include a mechanism for ensuring the response time of 5 minutes or less is met.

14. NATURAL DISASTERS:

a. TORNADO EMERGENCY:

I. Tornado Terms:

- ✓ **Tornado Watch:** Means Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information.
- ✓ **Tornado Warning:** A tornado has been sighted or indicated by weather radar. Take shelter immediately.

II. Protective Measures before and during a Tornado:

- ✓ Listen to NOAA Weather Radio or to commercial radio or television newscasts for the latest information & remain alert.
- ✓ Look for approaching danger signs such as a dark greenish sky or dark low-lying cloud with rotation or evidence of large hail.
- ✓ Listen for a loud roar, similar to a freight train.
- ✓ If you see approaching storms or any of the danger signs, be prepared to take shelter immediately or if you're under a tornado WARNING, seek shelter immediately!
- ✓ If inside an enclosed structure such as a small building, school, nursing home, hospital, factory, shopping center or high-rise building, go to a pre-designated shelter area such as a safe room, basement, storm cellar, or the lowest building level. If there is no basement, go to the center of an interior room on the lowest level (closet, interior hallway) away from corners, windows, doors, and outside walls. Put as many walls as possible between you and the outside. Get under a sturdy table and use your arms to protect your head and neck. Do not open windows.
- ✓ If outside with no shelter lie flat in a nearby ditch or depression and cover your head with your hands.
- ✓ Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

b. HURRICANE/CYCLONE EMERGENCY:

I. Hurricanes Terms:

- ✓ **Hurricane/Cyclone and Tropical Storm Watch**: Hurricane/tropical storm conditions are possible in the specified area, usually within 36 hours. Tune in to NOAA Weather Radio, commercial radio, or television for information.
- ✓ **Hurricane/Cyclone and Tropical Storm Warning**: Hurricane/tropical storm conditions are expected in the specified area, usually within 24 hours.

II. Hurricane/Cyclone Protective Measures before and during a Hurricane:

- ✓ Make plans to secure property by closing all windows, doors and roof vents if possible.
- ✓ Determine a safe room / location for shelter.
- ✓ Listen to the radio or TV for information.
- ✓ Turn off utilities if instructed to do so.
- ✓ Evacuate building if directed by local authorities and be sure to follow their instructions.

c. EARTHQUAKE EMERGENCY:

I. Protective Measures before and during an Earthquake:

- ✓ *Keep your cool, avoid panic and confusion and ride out the motion.*
- ✓ *Take cover under a sturdy desk, table, or bench or against an inside wall, and hold on. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.*
- ✓ *Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.*
- ✓ *Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.*
- ✓ *Remain inside until shaking stops and it is safe to go outside. Most injuries during earthquakes occur when people are hit by falling objects when entering into or exiting from buildings.*
- ✓ *Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.*
- ✓ *Do not use elevators during an Earthquake.*

Honeywell Internal

II. ***Post Earthquake Protective Measures:*** *Being prepared for aftershocks are extremely important. Even though secondary shockwaves are usually less violent, they can be strong enough to cause additional damage to already weekend structures.*

- ✓ *Check for injuries amongst those around you. Notify First Aid of injured persons as soon as safe to do so. Do not move the seriously injured unless they are in immediate danger. Try and keep the injured warm.*
- ✓ *Contact local emergency resource centers such as the hospital or fire department as required for injuries or fire concerns or call 9-911.*
- ✓ *Stay away from damaged areas unless your assistance has been specifically requested by police, fire, or relief organizations*
- ✓ *Listen for sounds or smell of leaking gas and exit building if the smell of gas apparent.*
- ✓ *Be aware of possible tsunamis if you live in coastal areas. These are also known as seismic sea waves (mistakenly called "tidal waves"). When local authorities issue a tsunami warning, assume that a series of dangerous waves is on the way. Stay away from the beach.*
- ✓ *Always open cabinets cautiously as objects may have shifted causing falling hazards.*
- ✓ *Never leave the worksite area unless you have advised your Site Manager. You may be jeopardizing your safety (bridge or road damage, et cetera) as well as create traffic congestion for emergency vehicles.*
- ✓ *If evacuation is ordered, leave by the nearest emergency exit and report directly to your designated assembly/rally point.*

d. VOLCANO EMERGENCY:

I. Protective Measures before and during a Volcanic Eruption:

- ✓ Monitor local radio stations and News Broadcasts
- ✓ Ensure the building / office ventilation system is turned off. This will keep ash particulates from entering building.
- ✓ Cover sensitive equipment with plastic sheets to keep ash particulates from entering parts.
- ✓ Evacuate immediately from the volcano area to avoid flying debris, hot gases, lateral blast and lava flow.
- ✓ Wear long-sleeved shirts and long pants.
- ✓ Use goggles and war eyeglasses instead of contact lenses.
- ✓ Use a dust mask or hold a damp cloth over your face to help with breathing.
- ✓ Stay away from areas downwind from the volcano to avoid volcanic ash.
- ✓ Stay indoors until the ash has settled unless there is a danger of the roof collapsing.
- ✓ Close doors, windows and turn off all ventilation systems.

e. TSUNAMI EMERGENCY:

I. Understanding Tsunamis Terms:

- ✓ Advisory: An earthquake has occurred in the Pacific basin, which might generate a tsunami.
- ✓ Watch: A tsunami was or may have been generated, but is at least two hours travel time to the area in Watch status.
- ✓ Warning: A tsunami was, or may have been generated, which could cause damage; therefore, people in the warned area are strongly advised to evacuate.

II. Tsunami Protective measures before and during a tsunami event:

- ✓ Turn on your radio to learn if there is a tsunami warning if an earthquake occurs and you are in a coastal area.
- ✓ Move inland to higher ground immediately and stay there.

- ✓ **Visual Indication of Imminent Tsunami** - Strong Earthquake lasting 20 seconds or more where it is difficult to stand or walk or the water level at the beach begins receding / being pulled back into the ocean.

15. Insert PDF of Building Evacuation Map and Location of Fire Extinguishers on Following Page